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Temperature, Salinity, and Density Data from the Hudson Strait Region During August–September, 1982

K.F. Drinkwater, G.B. Taylor and W.B. Petrie

Physical and Chemical Sciences Branch
Scotia-Fundy Region
Department of Fisheries and Oceans

Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
Canada B2Y 4A2

1991

Canadian Data Report of Hydrography and Ocean Sciences No. 99

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Canadian Data Report Of Hydrography and Ocean Sciences

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91-06354/

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by

K.F. Drinkwater, G.B. Taylor and W.M. Petrie

Physical and Chemical Sciences
Scotia-Fundy Region
Department of Fisheries and Oceans

Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
Canada, B2Y 4A2

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Cat. No. FS 97-16/99E ISSN 0711-6721

Correct citation for this publication:

Drinkwater, K.F., G.B. Taylor and W.M. Petrie. 1991. Temperature, salinity, and density data from the Hudson Strait region during August-September, 1982. Can. Data Rep. Hydrogr. Ocean Sci. 99: iv + 41 pp.

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ABSTRACT

Drinkwater, K.F., G.B. Taylor and W.M. Petrie. 1991. Temperature, salinity, and density data from the Hudson Strait region during August-September, 1982. Can. Data Rep. Hydrogr. Ocean Sci. 99: iv + 41 pp.

Measurements of temperature (T), salinity (S), and sigma-theta (σ_θ) at 130 stations in Hudson Strait and vicinity during 15 August to 7 September, 1982 are presented in graphical form. Oceanographic sections are plotted as well as contours of T and S at two depths, near surface and at 50 m. For selected stations, we also present vertical profile plots (T, S and σ_θ vs. depth) and T-S diagrams (T vs. S).

RESUME

Drinkwater, K.F., G.B. Taylor and W.M. Petrie. 1991. Temperature, salinity, and density data from the Hudson Strait region during August-September, 1982. Can. Data Rep. Hydrogr. Ocean Sci. 99: iv + 41 pp.

On présente ici des graphiques des mesures de température (T), de salinité (S) et de sigma-theta (σ_θ) relevées dans 130 stations du détroit d'Hudson et des environs, du 15 août au 17 septembre 1982. Les coupes océanographiques y sont indiquées ainsi que les courbes de T et S à des profondeurs données, à proximité de la surface et à une profondeur de 50 m. Pour certaines stations, on présente aussi des profils verticaux (T, S et σ_θ par rapport à la profondeur) et des diagrammes T-S (T par rapport à S).

Introduction

This data report presents temperature, salinity, and density (sigma-θ) data collected during an oceanographic cruise to Hudson Strait in August-September of 1982. Prior studies had suggested that the characteristics of the Labrador Shelf water were formed in Hudson Strait through the mixing of waters from the Baffin Island Shelf, deep waters from the Labrador Sea, and relatively low salinity waters from Hudson Bay (Dunbar 1951; Kollmeyer et al. 1967). Indeed, Kollmeyer et al. (1967) had called the region of eastern Hudson Strait the "birthplace" of the Labrador Shelf waters. Sutcliffe et al. (1983) later suggested that mixing in Hudson Strait also had important biological consequences through surface nutrient enrichment and subsequent nutrient flux onto the Labrador Shelf.

One of the objectives of the physical oceanographic field study in the late summer of 1982 was to improve our understanding of the circulation in Hudson Strait. A moored current meter array was deployed in the Strait immediately to the west of Ungava Bay during the cruise and was recovered during a separate voyage in October, 1982. A graphical presentation of the current meter data was provided by Drinkwater (1983) and a discussion of the mean and tidal currents from the array can be found in Drinkwater (1988). Another major objective was to identify the primary mixing mechanism within Hudson Strait. From extensive hydrographic data collected during the cruise Drinkwater and Jones (1987) concluded that the intense mixing was of tidal origin. This was based upon a comparison of the observed density stratification with that predicted by Griffiths et al. (1981) using a numerical tidal model and the h/u^3 criteria of Simpson and Hunter (1974).

With continuing interest in the oceanography of the region and the possibility of new research initiatives on the marine ecology within Hudson Strait (Percy 1990), we felt that a graphical presentation of the hydrographic data may provide useful background information for future studies.

Data and Methods

Vertical profiles of temperature and salinity were recorded at 130 stations during a field study between 15 August and 7 September, 1982 on board the *CSS Hudson*. Stations were occupied off St. John's, Newfoundland (Stn. 1), on the Labrador Shelf (Stn. 2-16, 89-98), in Hudson Strait (Stn. 17-47, 67-79, 99-130), in northern Hudson Bay (Stn. 48-58), in southern Foxe Basin (Stn. 59-66), and on the eastern Baffin Island Shelf (Stn. 80-88). The station positions (except station 1) are plotted in Fig. 1. No temperature and salinity data were obtained at station 64 in Foxe Basin because of heavy ice cover. The measurements were taken with a Guildline digital CTD (Conductivity-Temperature-Depth) profiler. A rosette sampler was attached to the CTD from which calibration samples were collected, typically at 10 depths per cast for salinity. Reversing thermometer temperatures were generally obtained at two depths per cast. Large spikes in the data were first removed and then calibrations were applied to the raw data file. Water densities were calculated from the corrected temperature and salinity data using the UNESCO 1980 formulation and expressed as sigma-θ (σ_θ). The accuracy of the temperature and salinity measurements are estimated at $\pm 0.01^{\circ}C$ and ± 0.02 p.s.u. (practical salinity units), respectively. The data were then smoothed and reduced to 1 data point every 2 m. These smoothed data have been archived and are available from the Bedford Institute of Oceanography or the Marine Environmental Data Service (MEDS) in Ottawa.

Graphic Presentations

Transects of temperature, salinity, and sigma-θ are plotted in Fig. 2 through 21. Because of the relatively small changes in hydrographic properties between the closely spaced stations in the eastern entrance to Hudson Strait (107-130; Fig. 1), these data have not been plotted. Contours of temperature and salinity on depth surfaces near the surface and at 50 m are presented in Fig. 22-25. The final plots are vertical profiles of temperature,

salinity and sigma-θ plus temperature-salinity (T-S) diagrams for selected stations (Fig. 26-37).

ACKNOWLEDGEMENTS

We wish to thank all those who participated in the collection of the CTD data including Captain Mauger and the crew of the *CSS Hudson*. A special thanks to P. Jones, chief scientist of the cruise.

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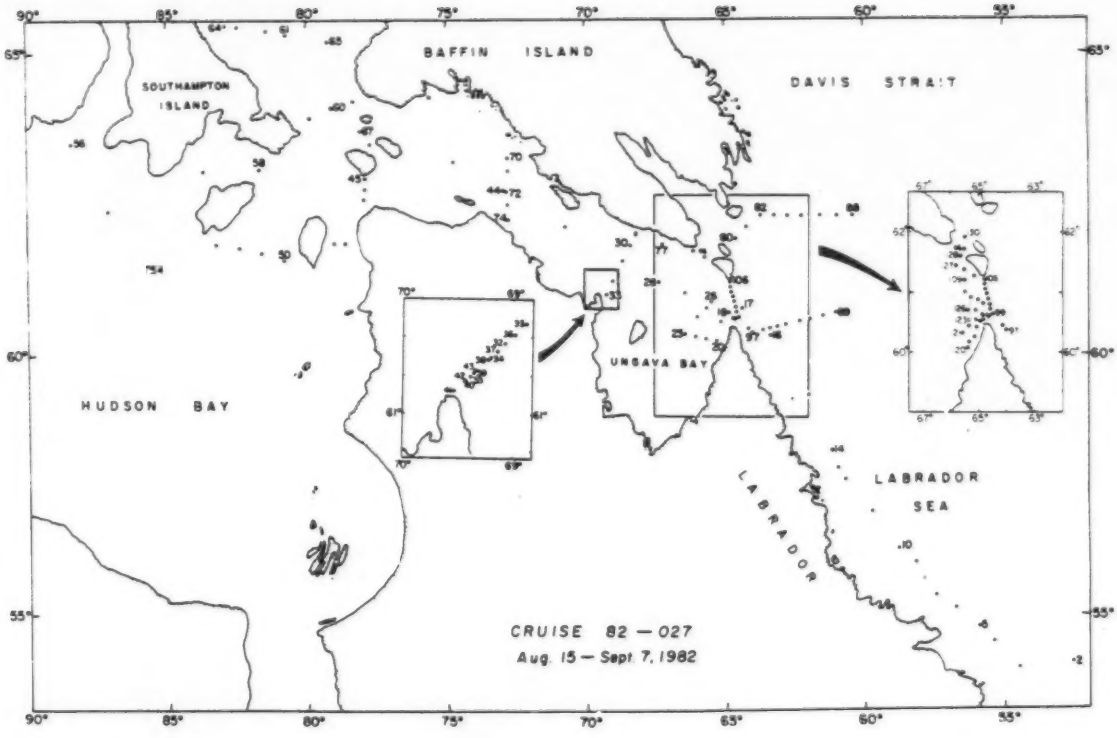


Fig. 1. Hudson Strait and vicinity showing the location of the CTD stations.

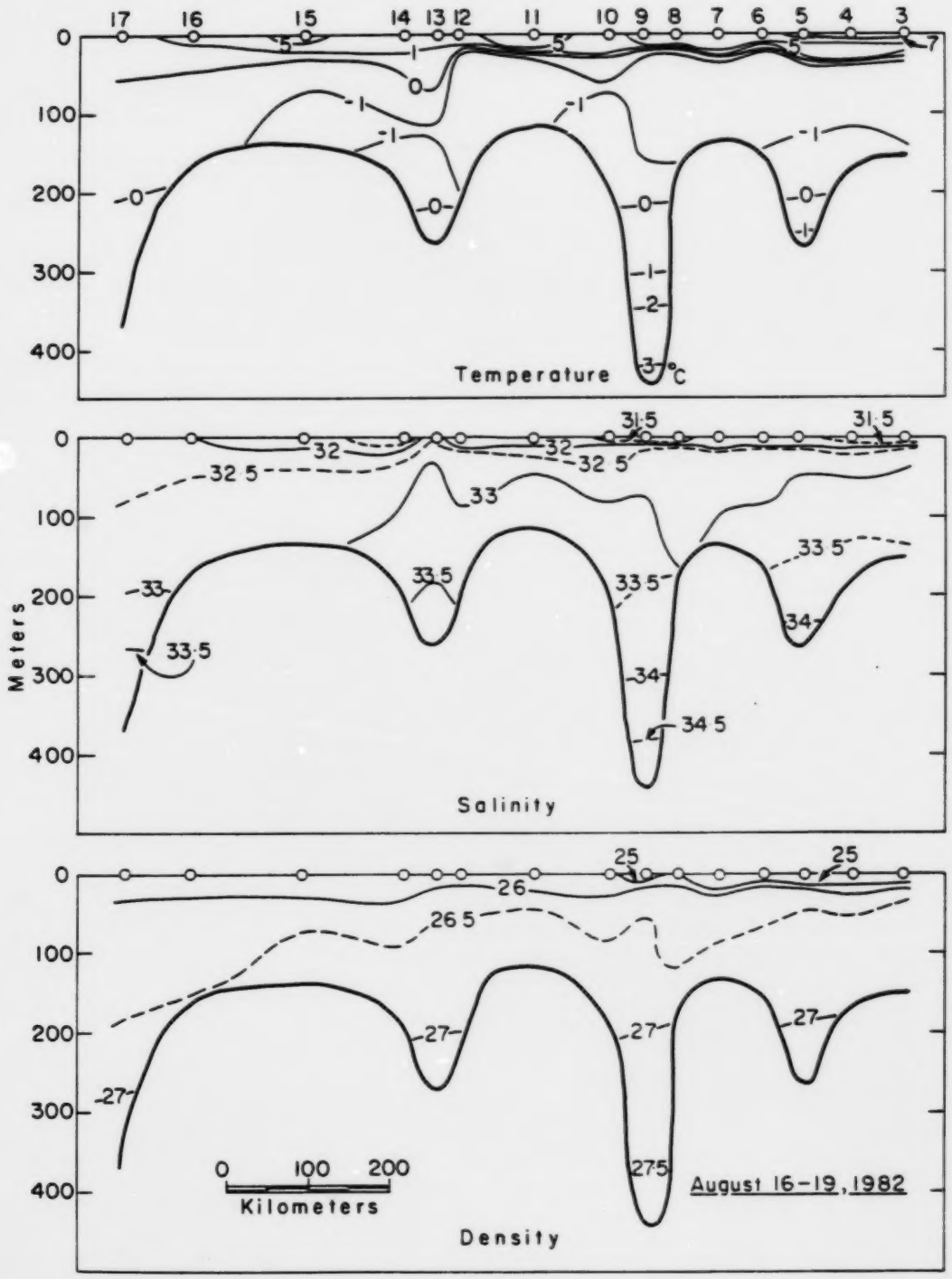


Fig. 2. Transects of temperature, salinity, and density (σ_θ) along the Labrador Shelf (Stn. 3-17).

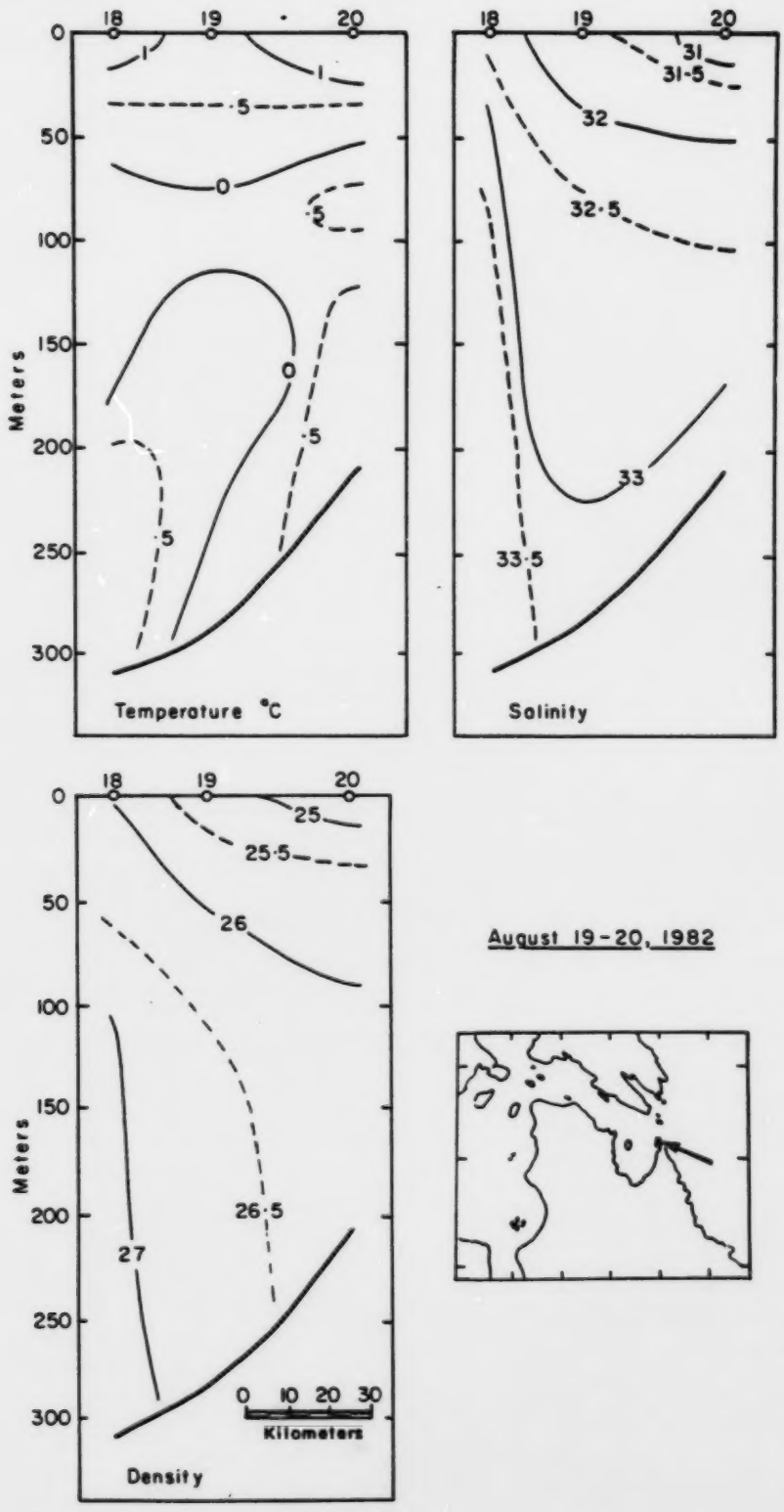


Fig. 3. Transects of temperature, salinity and density (σ_θ) in northeastern Ungava Bay (Stn. 18-20).

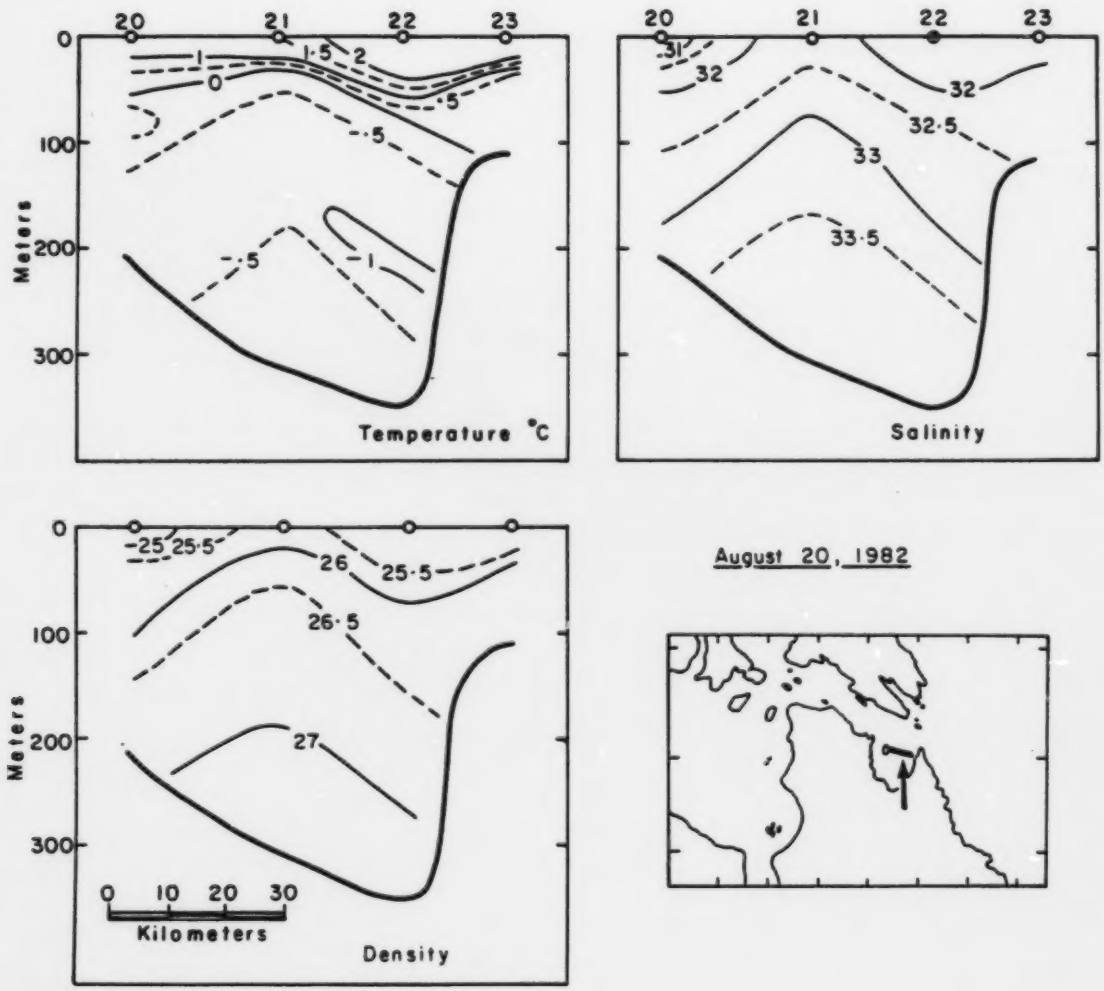


Fig. 4. Transects of temperature, salinity and density (σ_θ) across the mouth of Ungava Bay (Stn. 20-23).

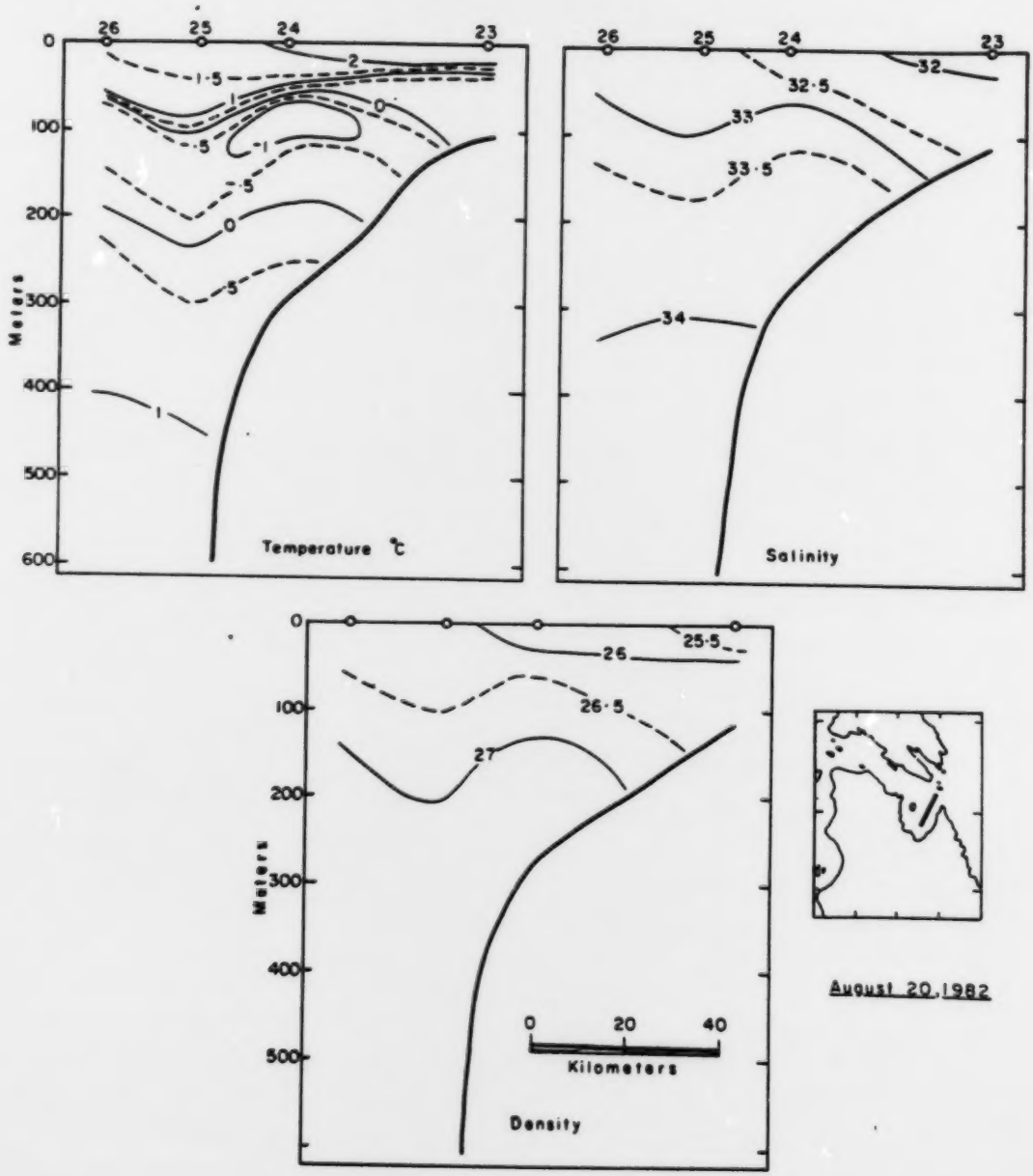


Fig. 5. Transects of temperature, salinity and density (σ_θ) from Ungava Bay into Hudson Strait (Stn. 23-26).

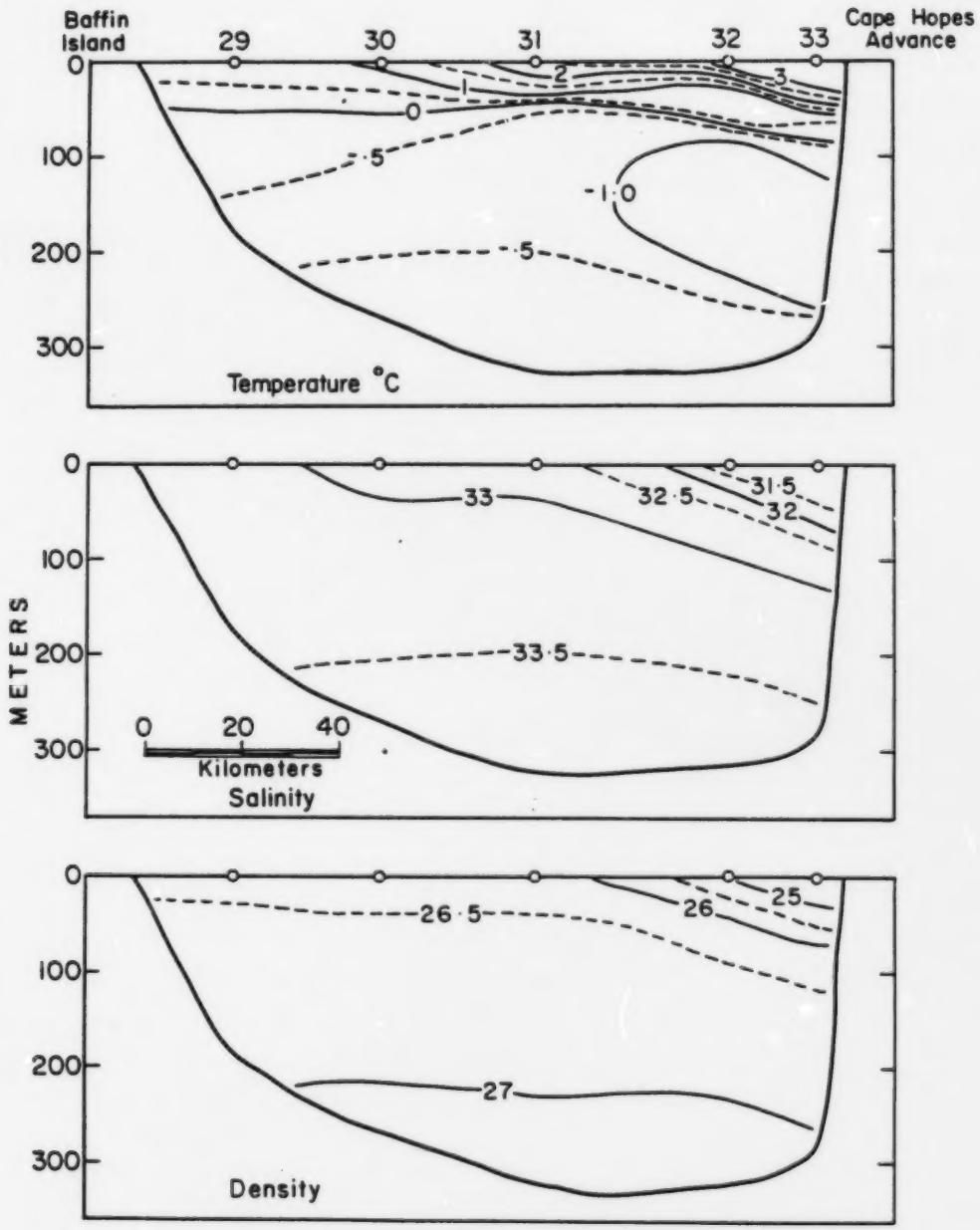
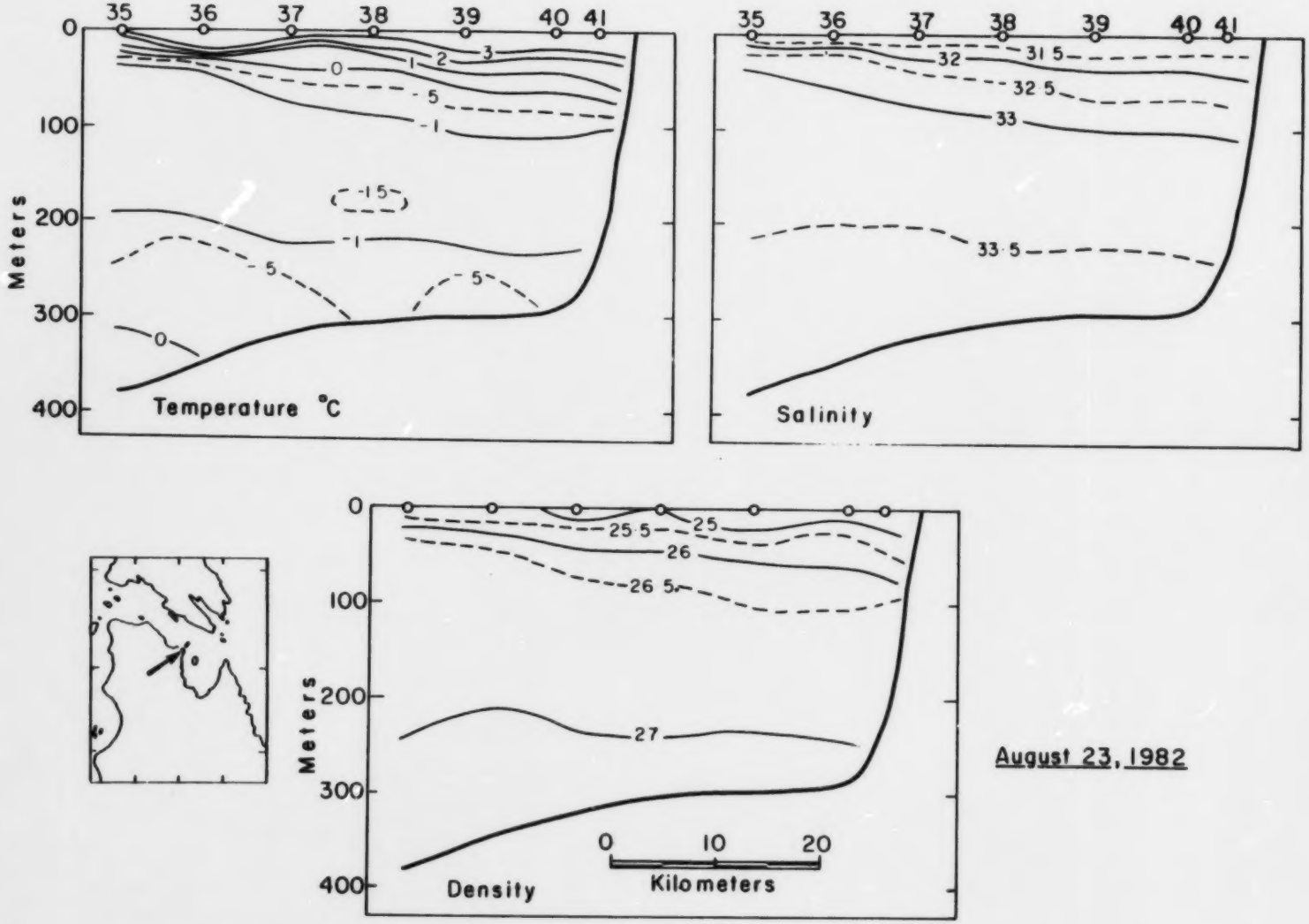


Fig. 6. Transects of temperature, salinity and density (σ_θ) across Hudson Strait off Cape Hopes Advance (Stn. 29-33).



August 23, 1982

Fig. 7. Transects of temperature, salinity and density (σ_θ) off Cape Hopes Advance (Stn. 35-41).

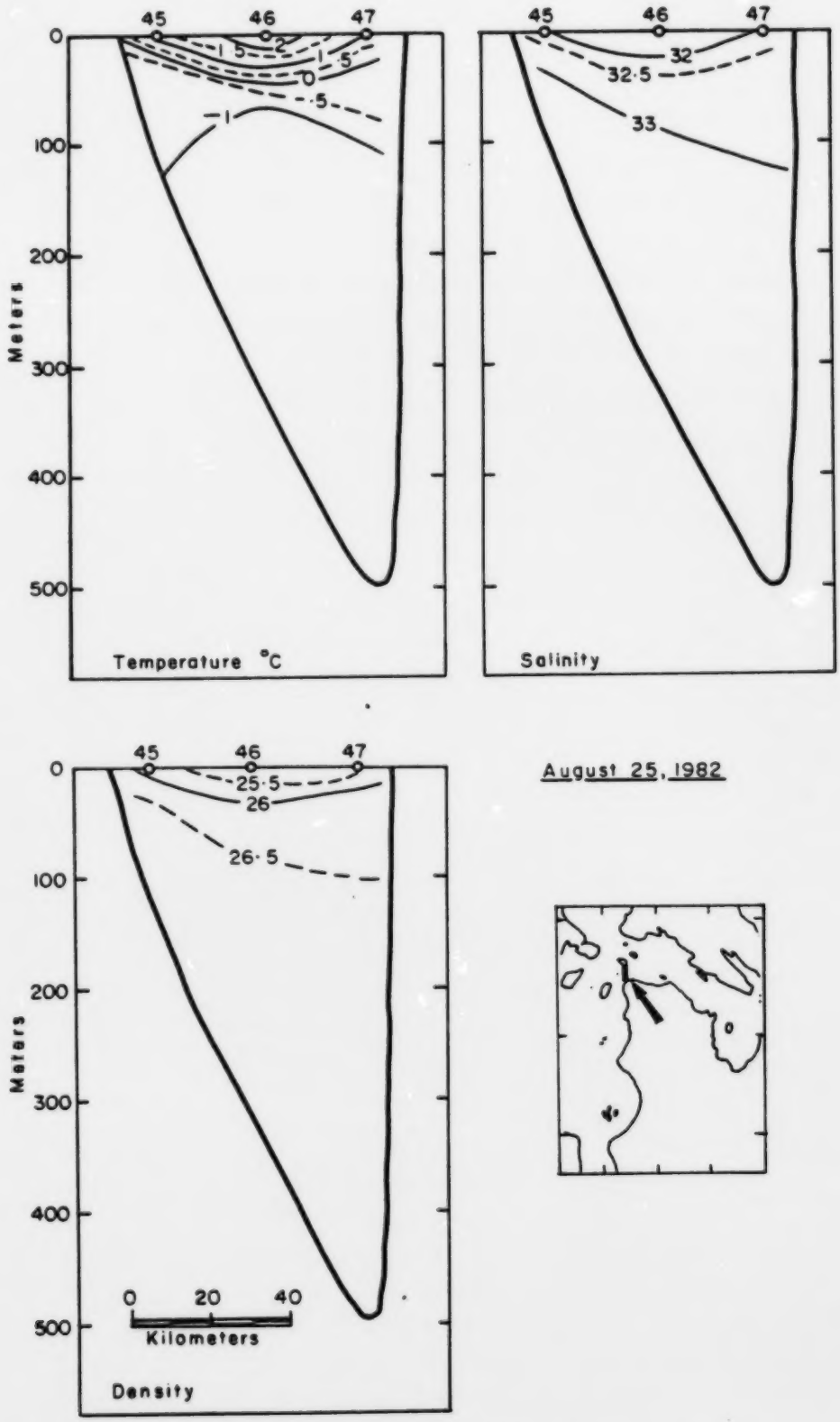


Fig. 8. Transects of temperature, salinity and density (σ_θ) at the southwestern entrance to Hudson Strait (Stn. 45-47).

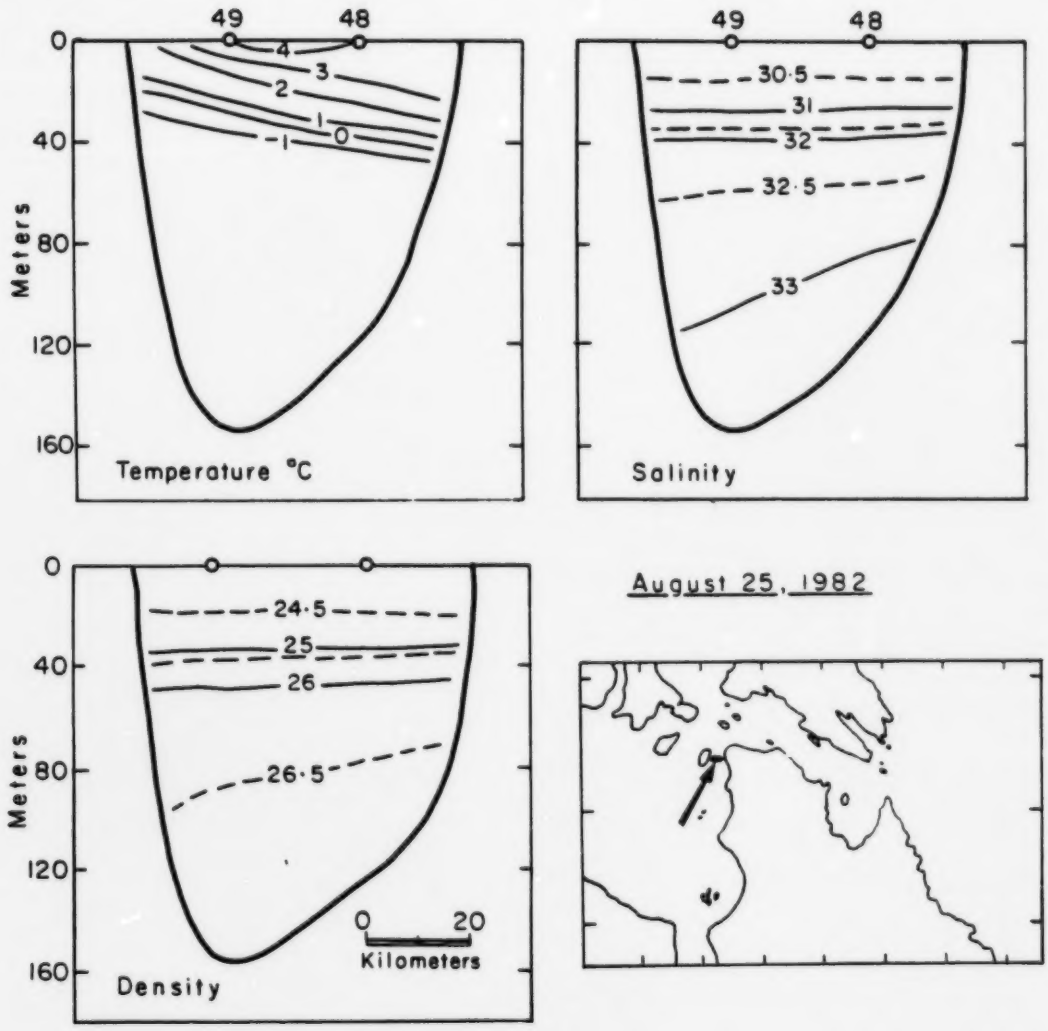


Fig. 9. Transects of temperature, salinity and density (σ_θ) in northeastern Hudson Bay (Stn. 48-49).

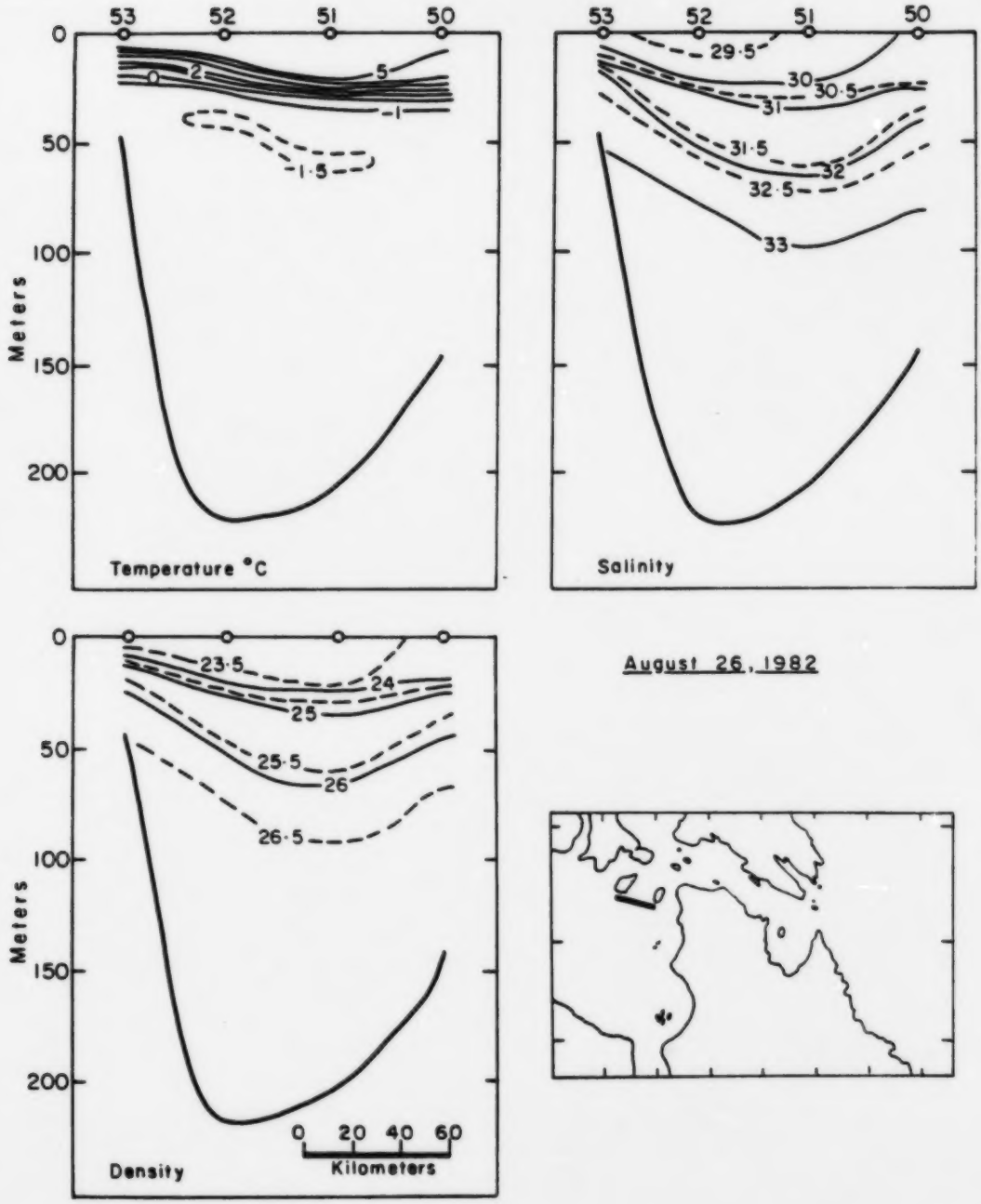


Fig. 10. Transects of temperature, salinity and density (σ_θ) in north central Hudson Bay (Stn. 50-53).

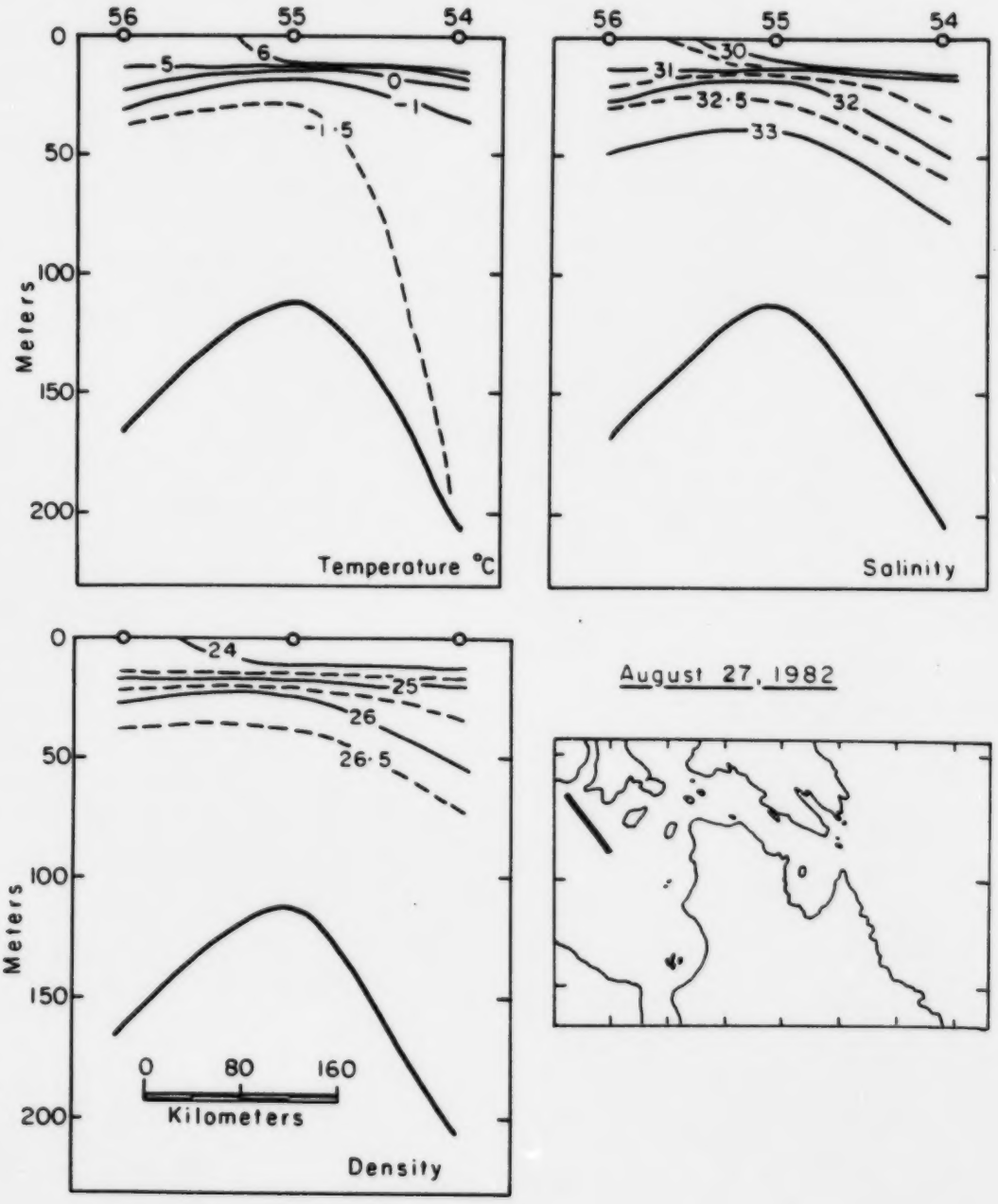


Fig. 11. Transects of temperature, salinity and density (σ_θ) in northwestern Hudson Bay (Stn. 54-56).

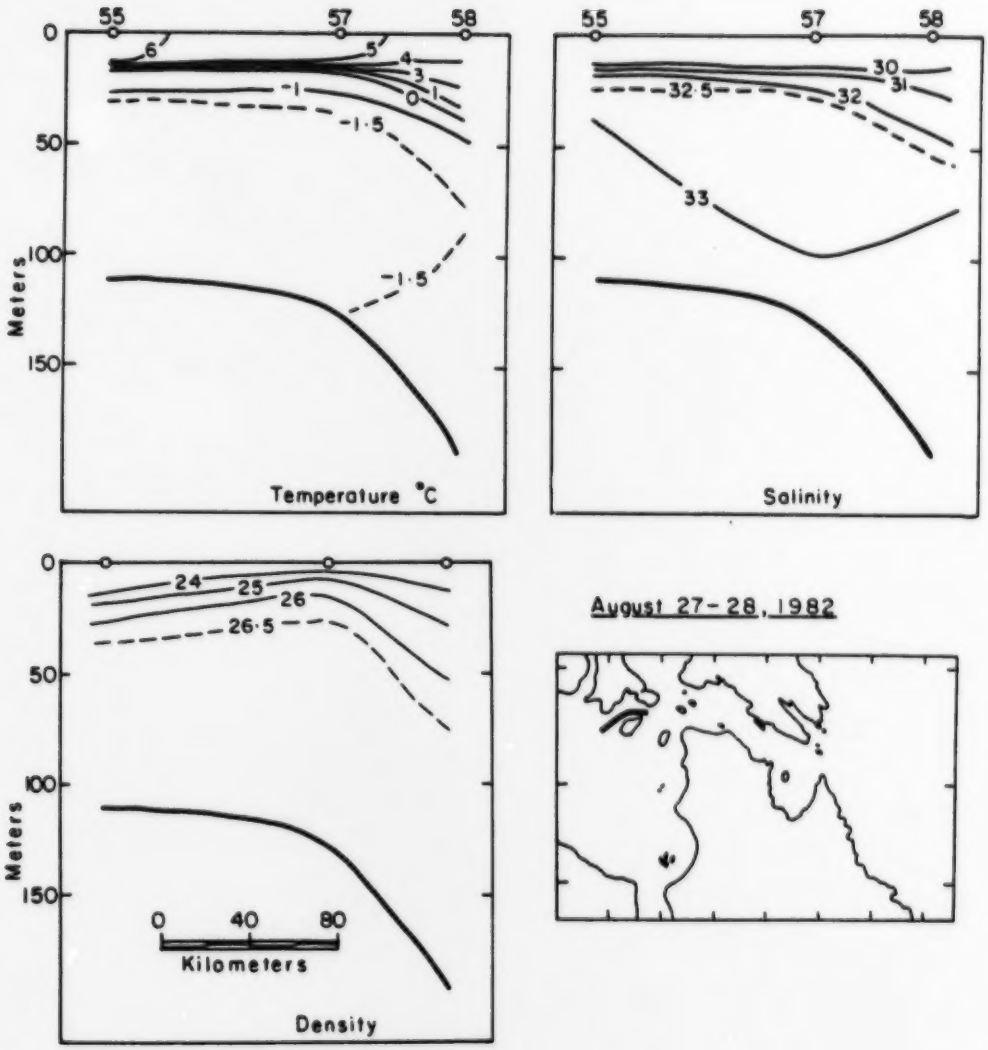


Fig. 12. Transects of temperature, salinity and density (σ_θ) in northern Hudson Bay south of Southampton Island (Stn. 55, 57-58).

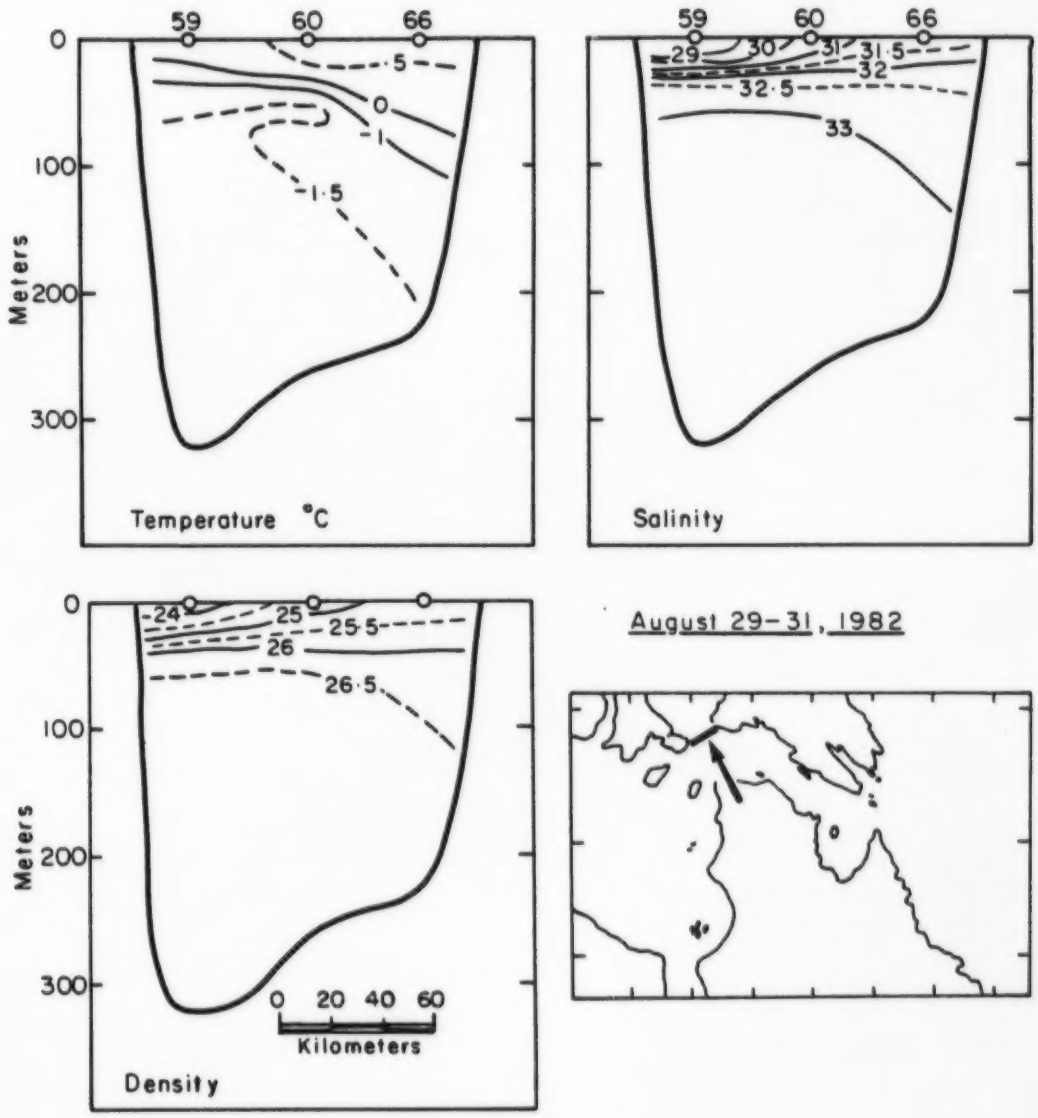


Fig. 13. Transects of temperature, salinity and density (σ_θ) at the southern entrance to Foxe Basin (Stn. 59-60, 66).

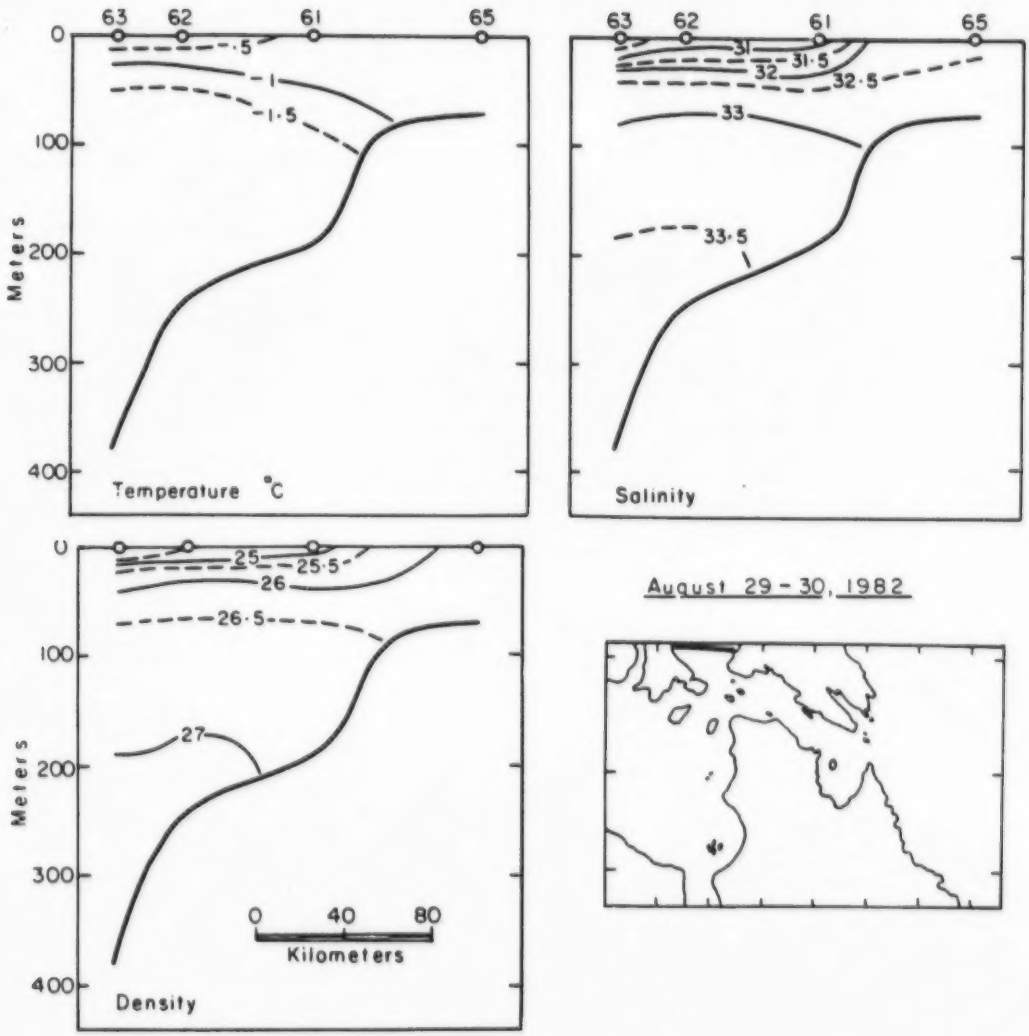


Fig. 14. Transects of temperature, salinity and density (σ_θ) in southern Foxe Basin (Stn. 61-65).

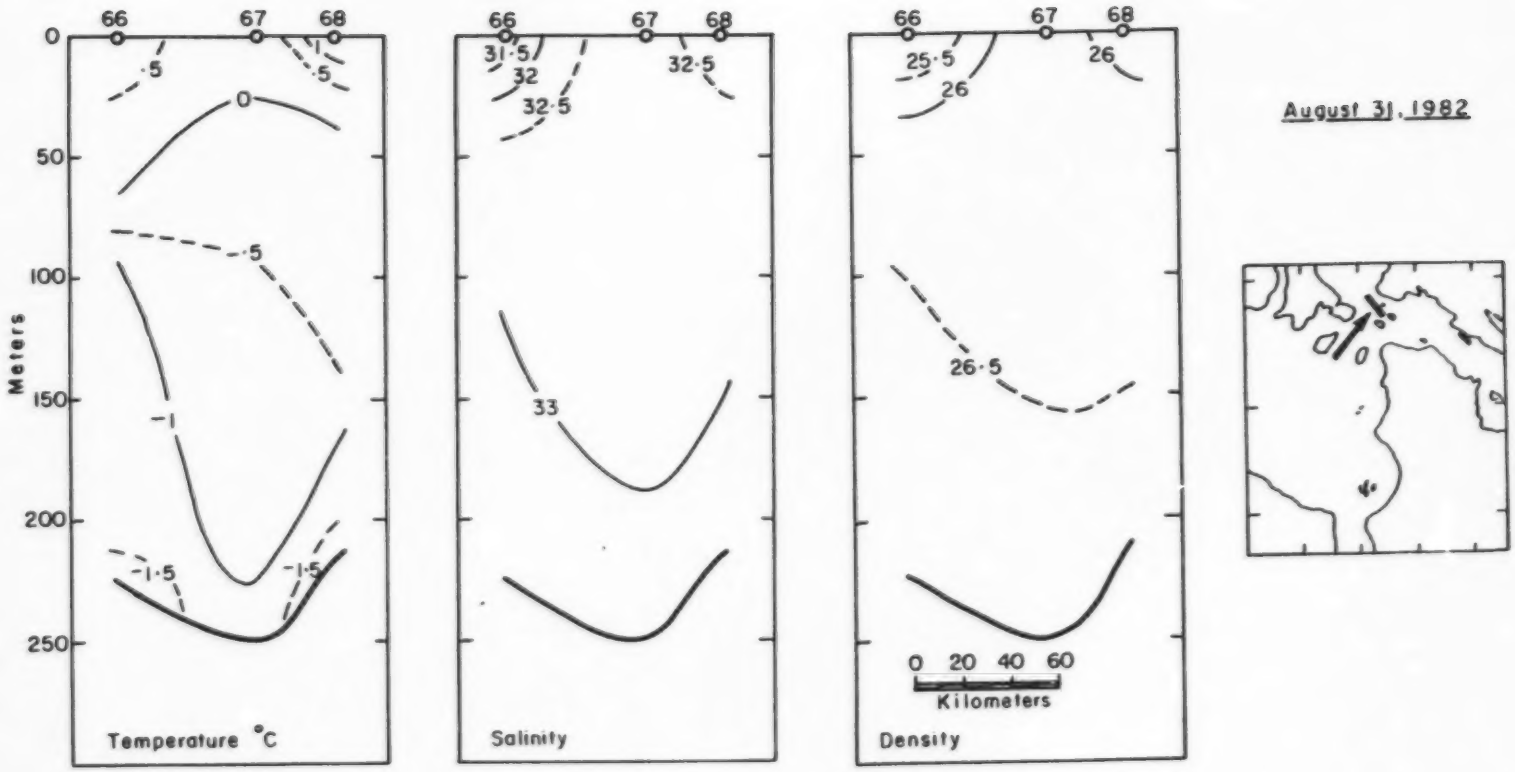


Fig. 15 Transects of temperature, salinity and density (σ_θ) from Foxe Basin to western Hudson Strait (Stn. 66-68).

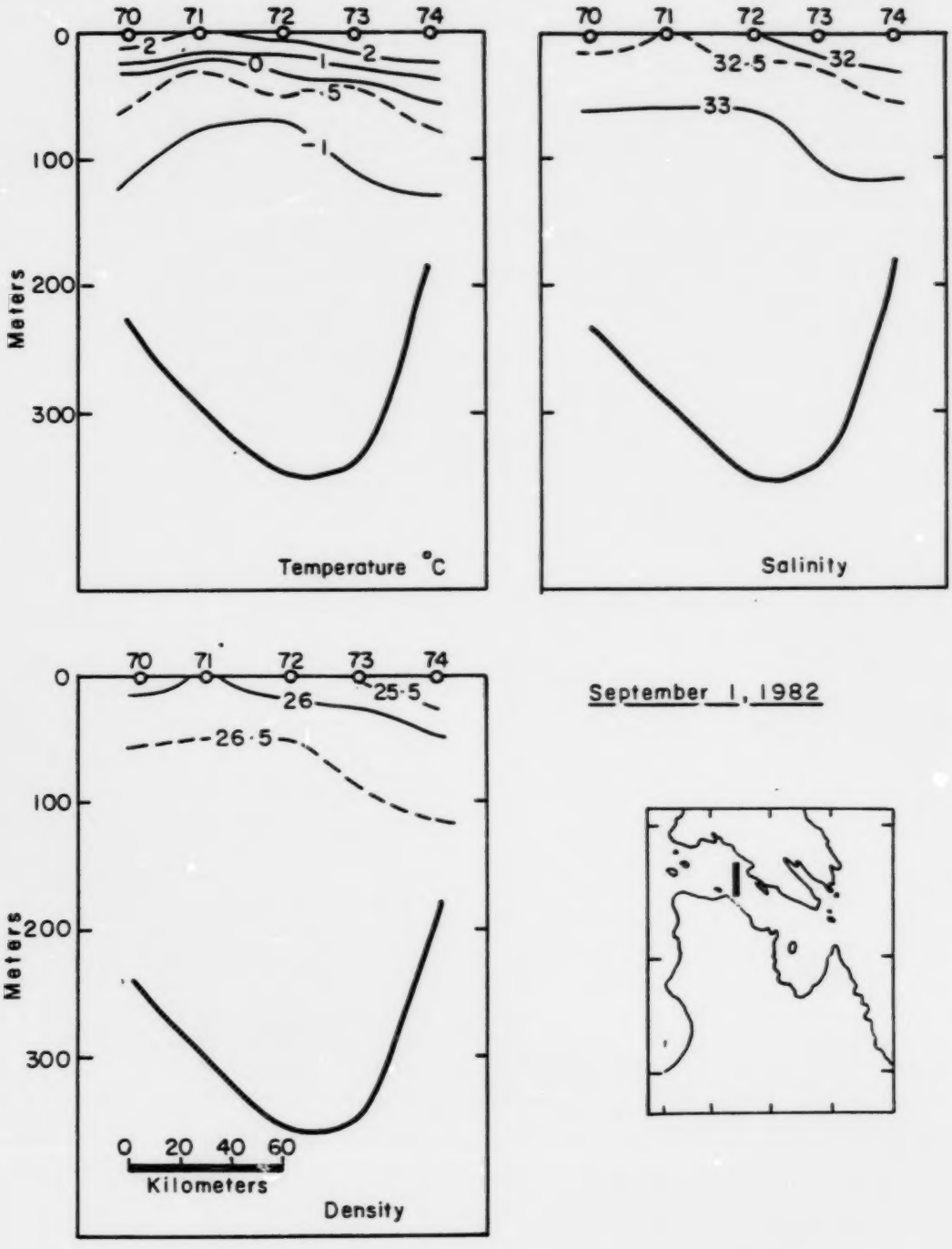


Fig. 16. Transects of temperature, salinity and density (σ_θ) across Hudson Strait near Charles Island (Stn. 70-74).

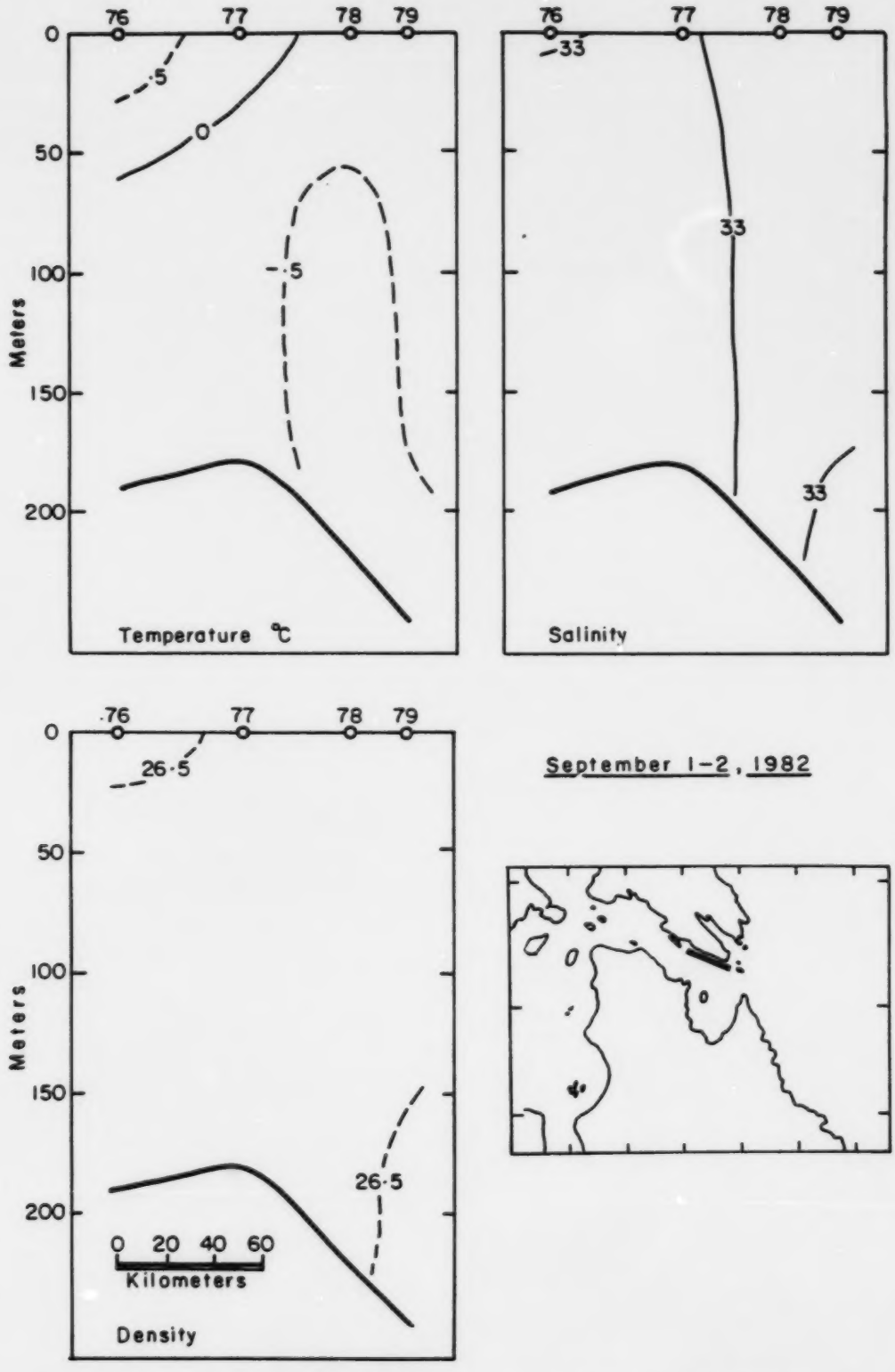


Fig. 17. Transects of temperature, salinity and density (σ_θ) off southeastern Baffin Island (Stn. 76-79).

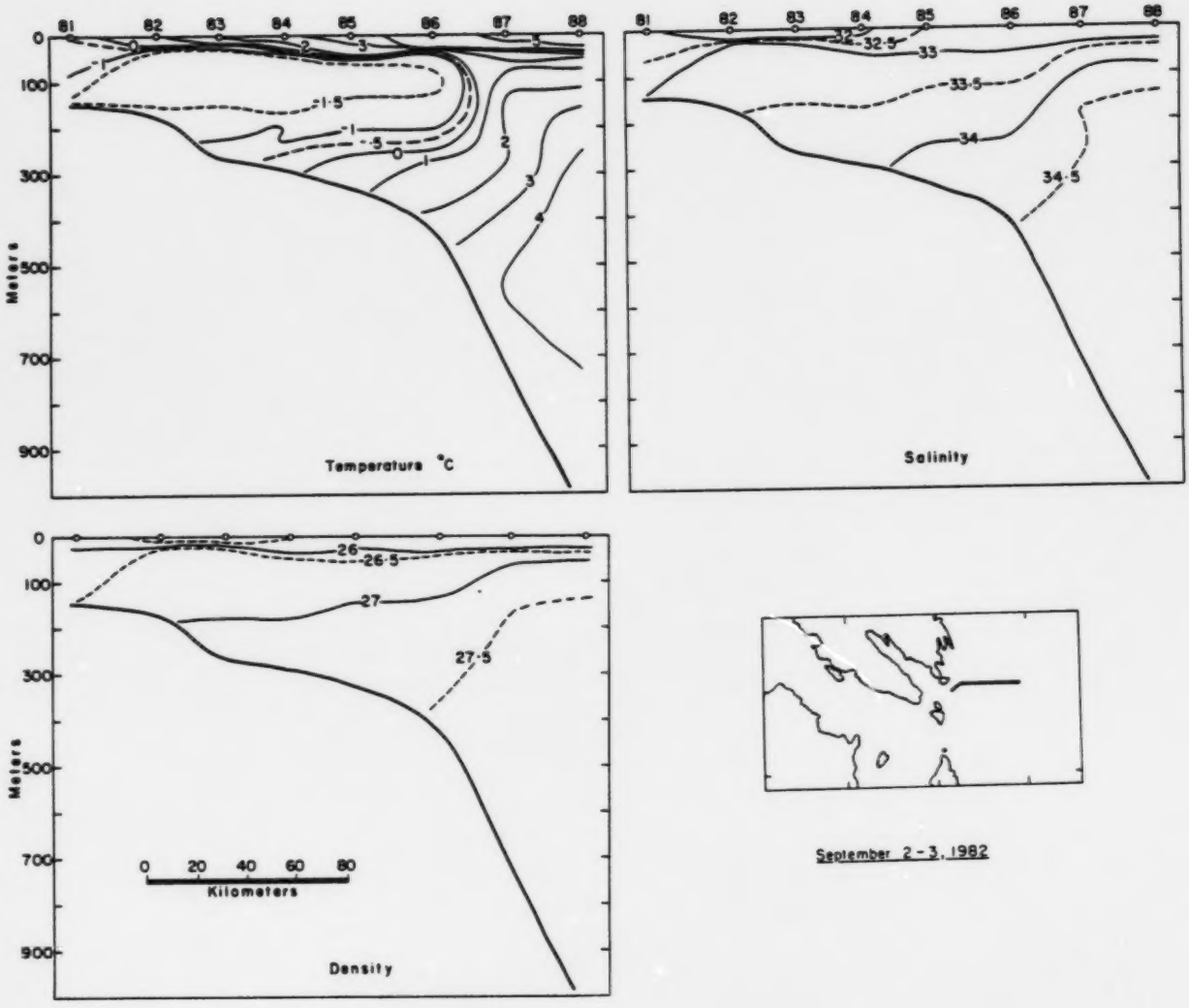


Fig. 18. Transects of temperature, salinity and density (σ_θ) on the southern Baffin Island Shelf (Stn. 81-88).

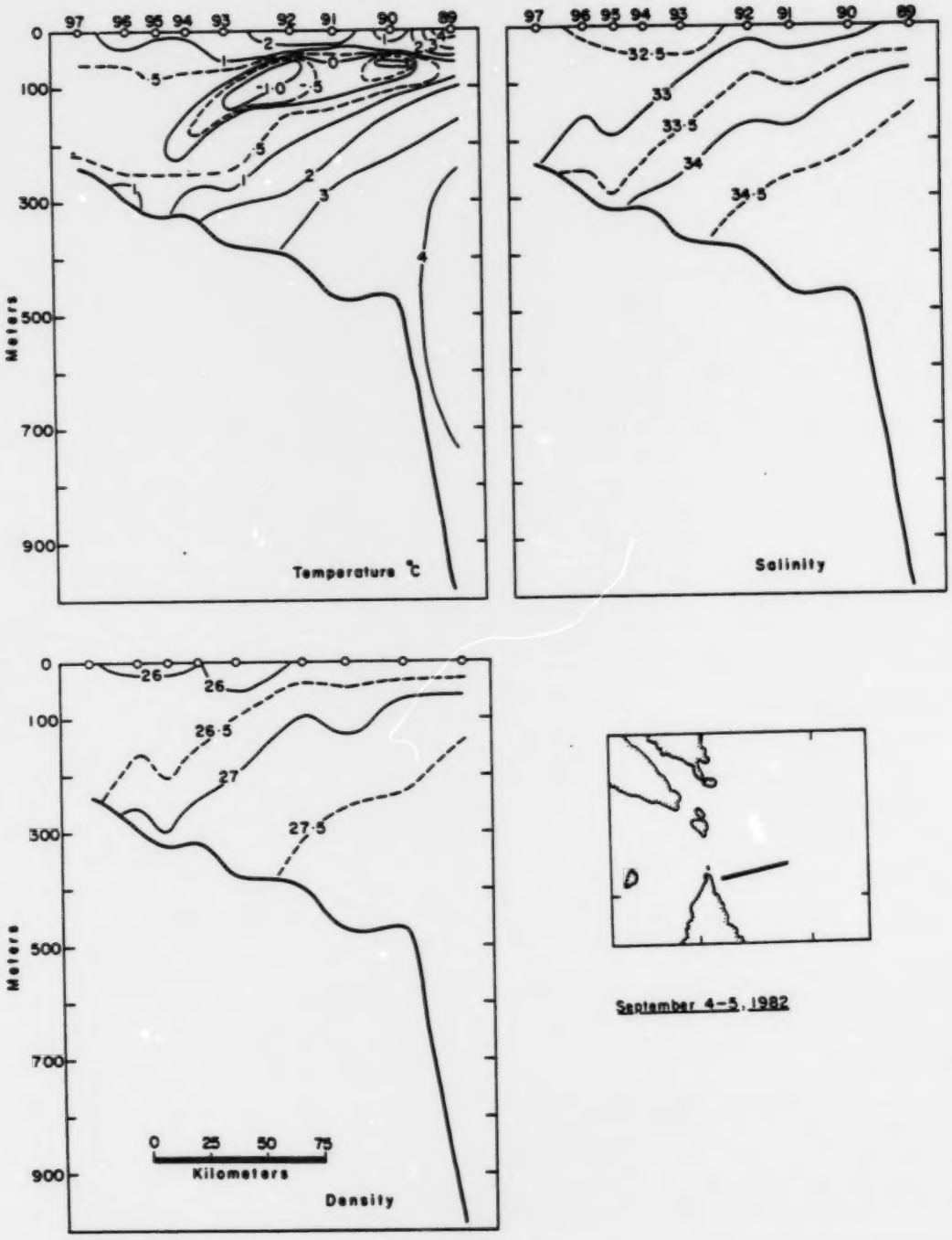


Fig. 19. Transects of temperature, salinity and density (σ_θ) on the northern Labrador Shelf (Stn. 89-97).

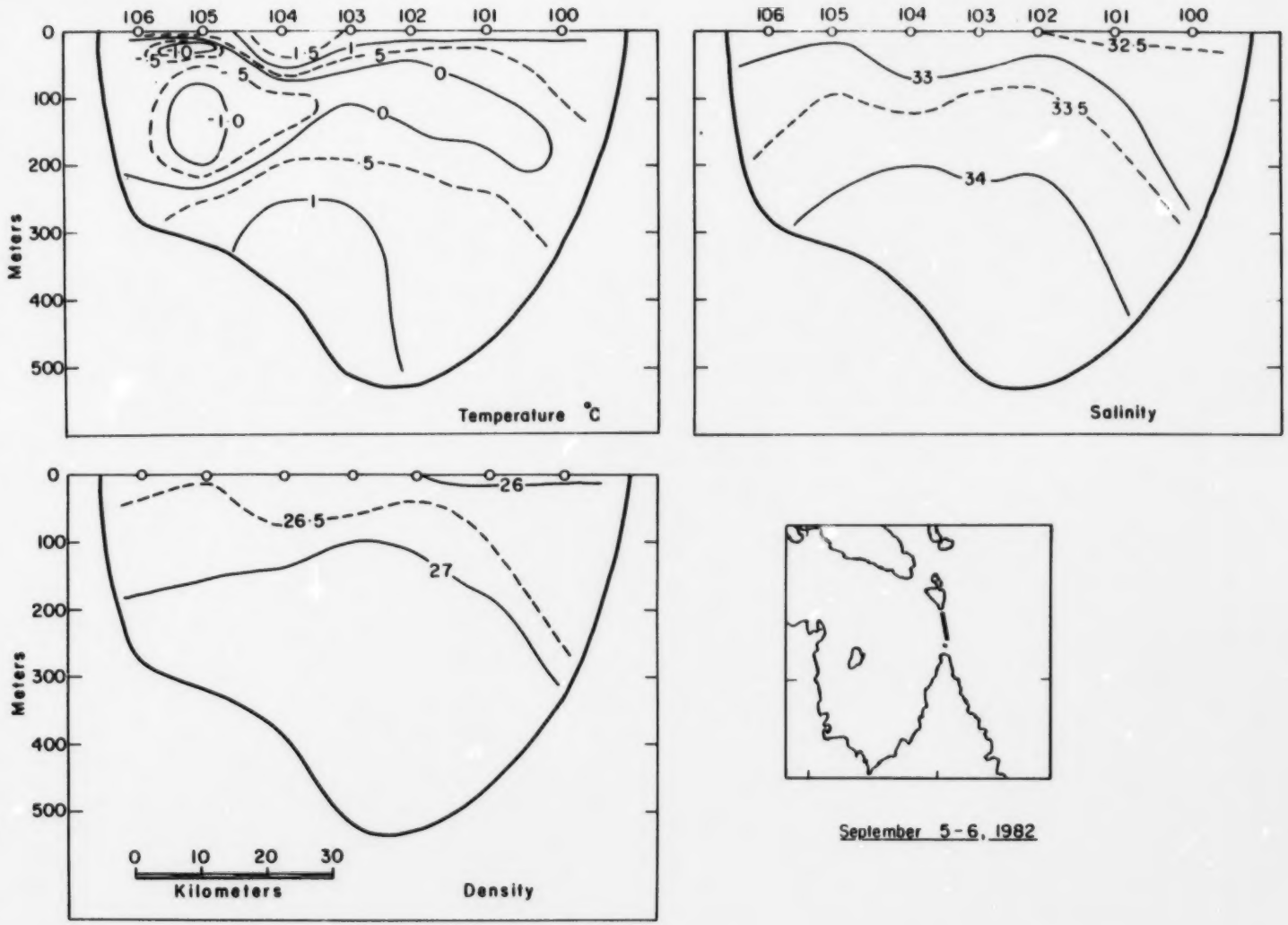


Fig. 20. Transects of temperature, salinity and density (σ_θ) across the eastern entrance of Hudson Strait (Stn. 100-106).

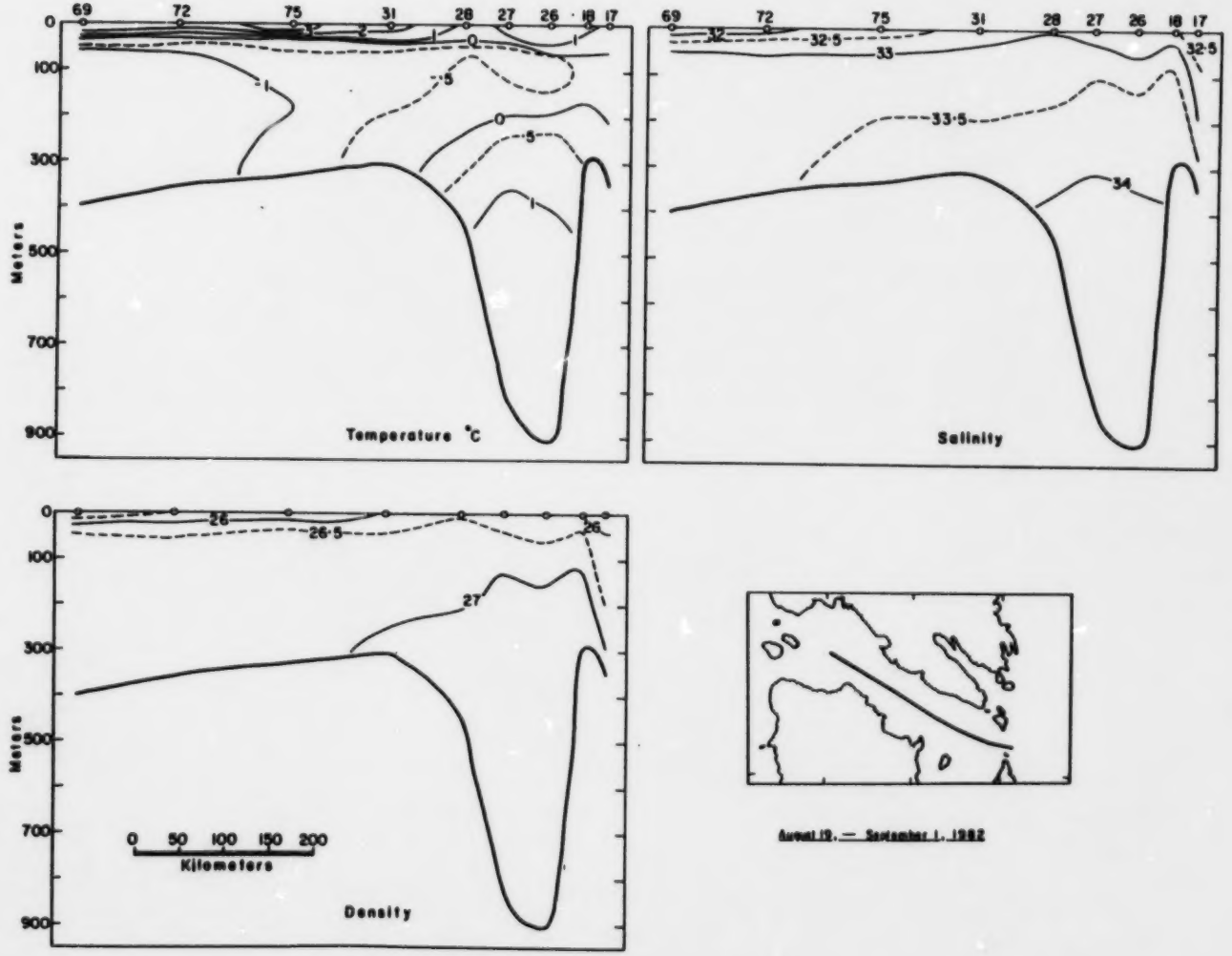


Fig. 21. An along-channel transects of temperature, salinity and density (σ_θ) in Hudson Strait (Stn. 17-18, 26-28, 31, 69, 72, 75).

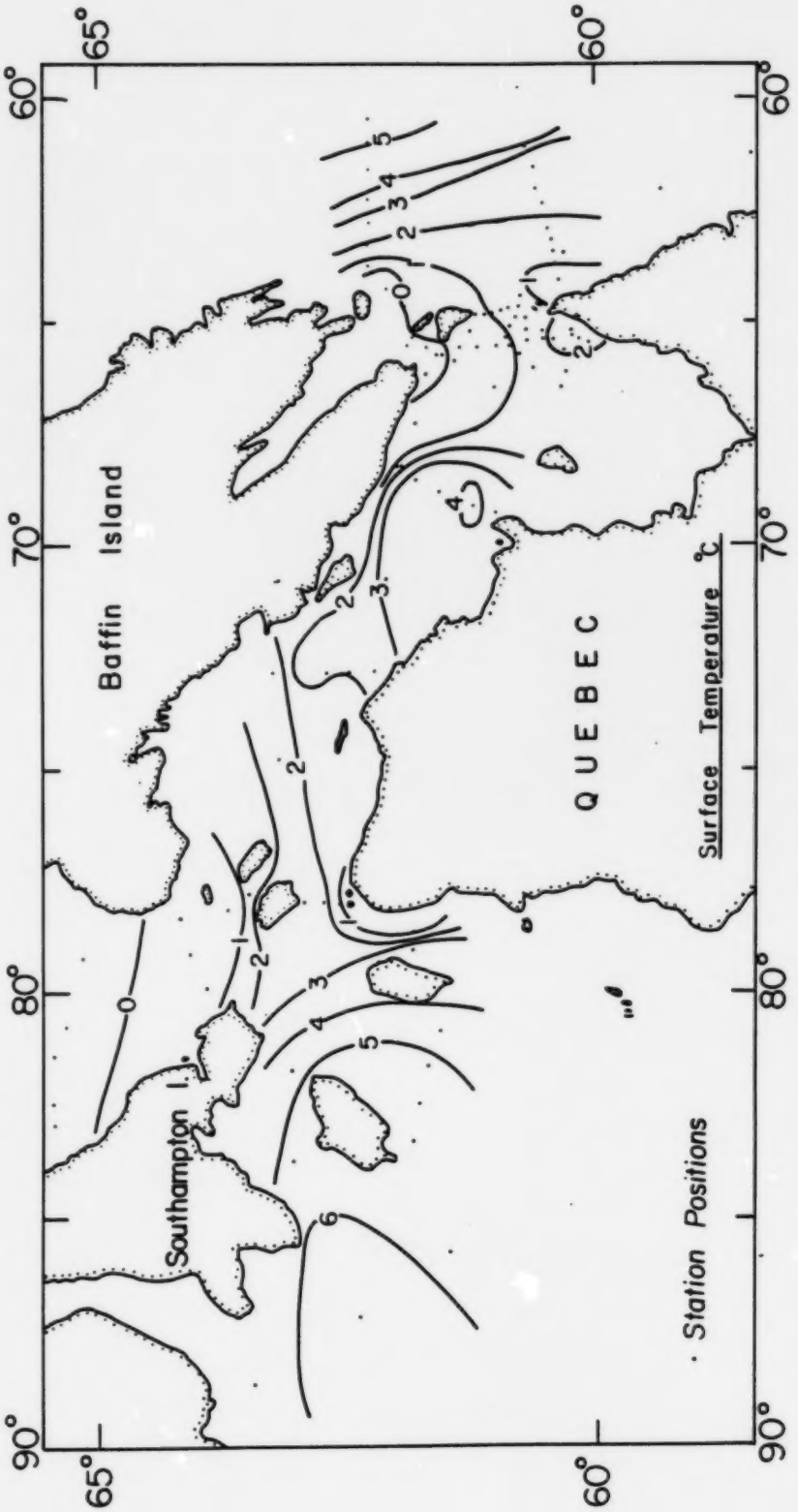


Fig. 22. Temperature contours in the near surface waters.

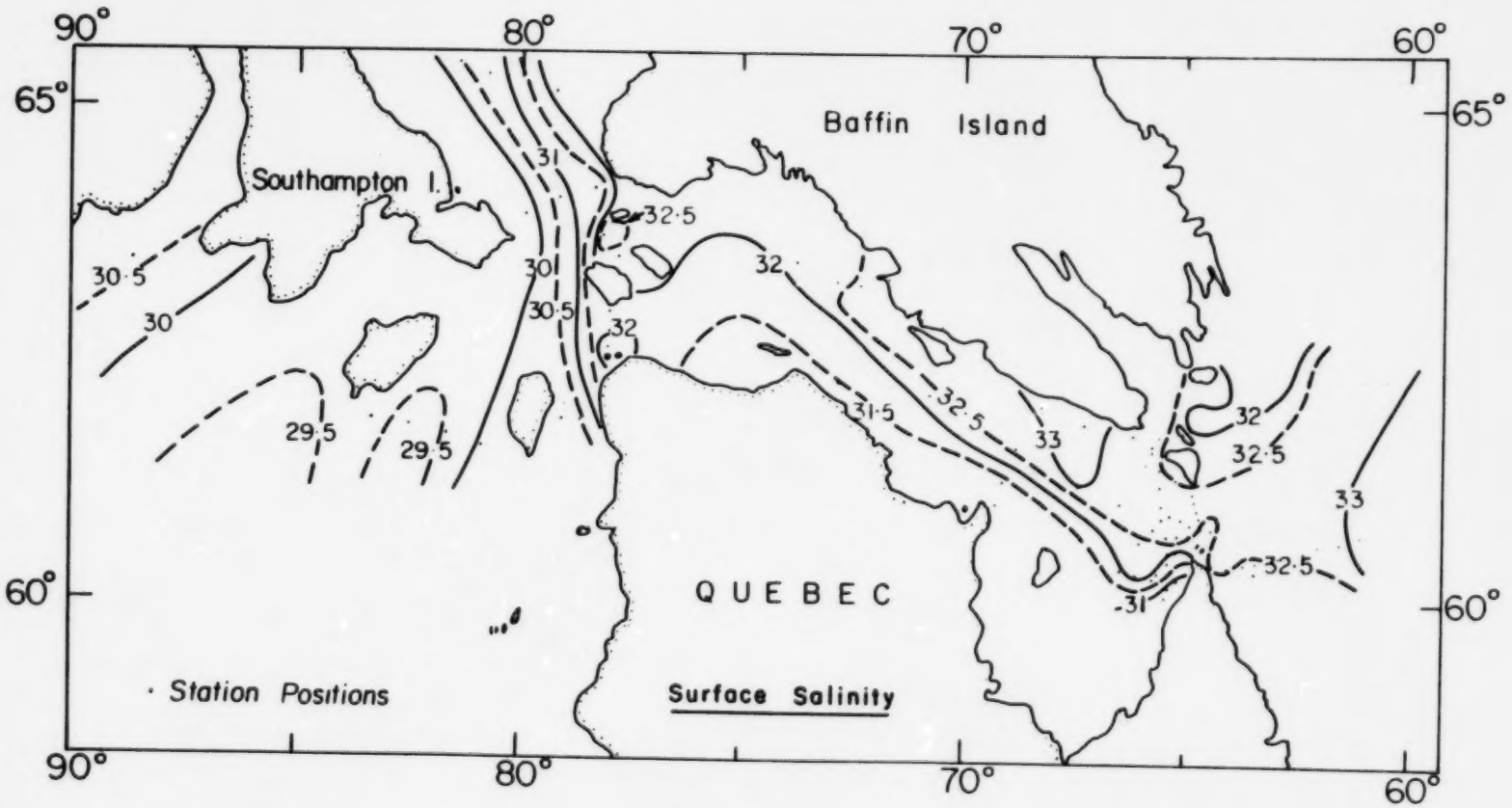


Fig. 23. Salinity contours in the near surface waters.

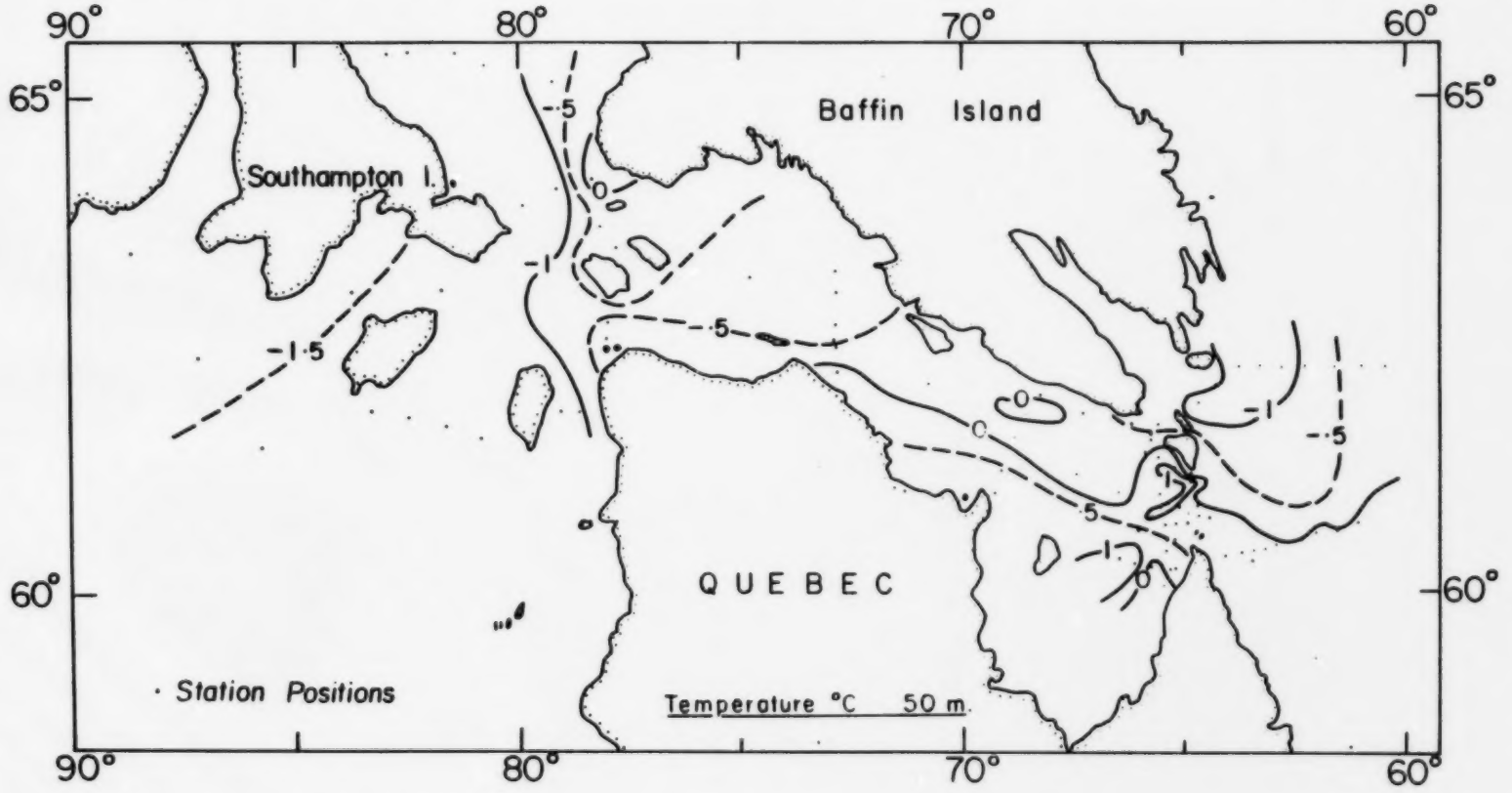


Fig. 24. Temperature contours at 50 m depth.

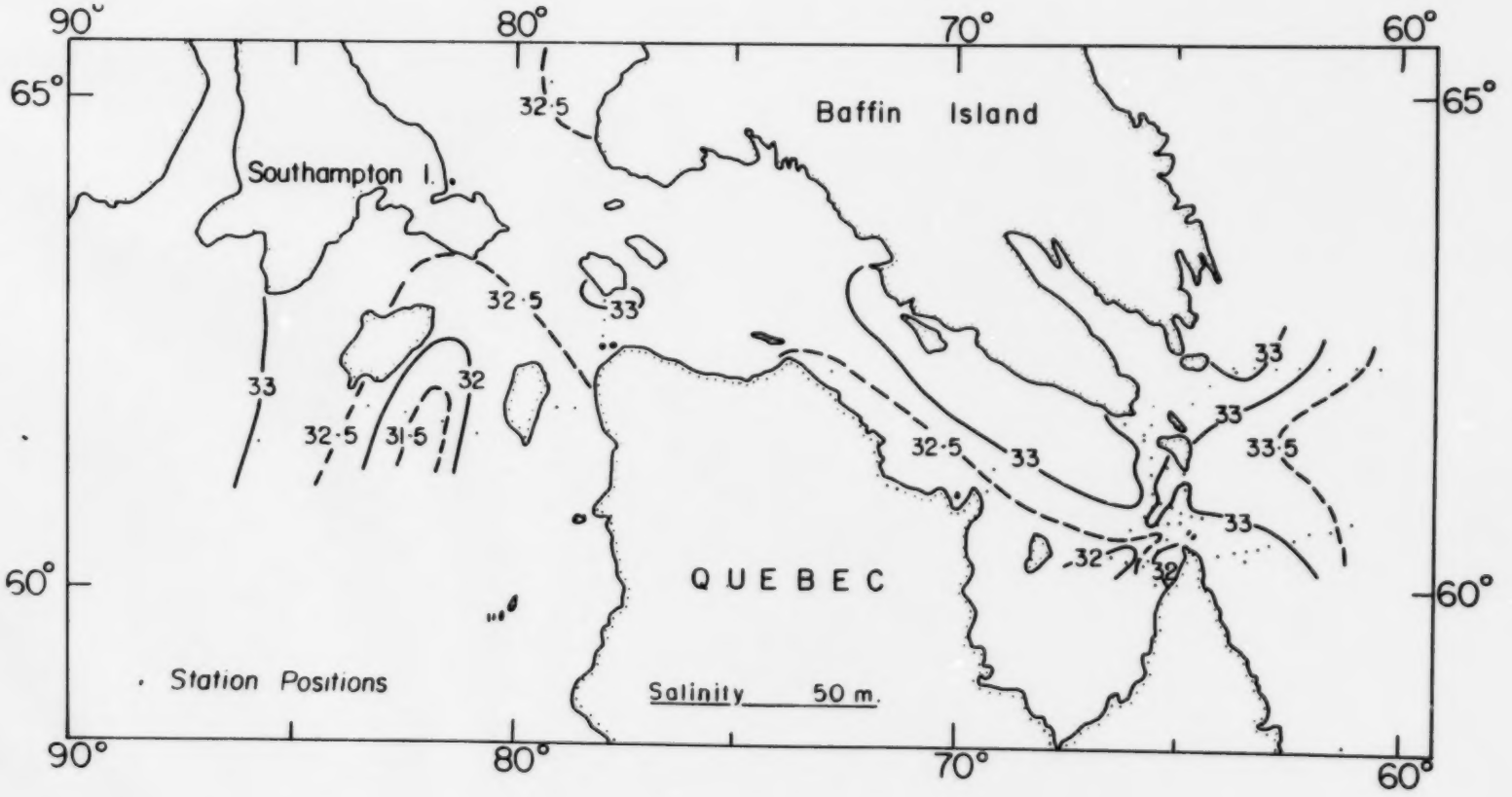


Fig. 25. Salinity contours at 50 m depth.

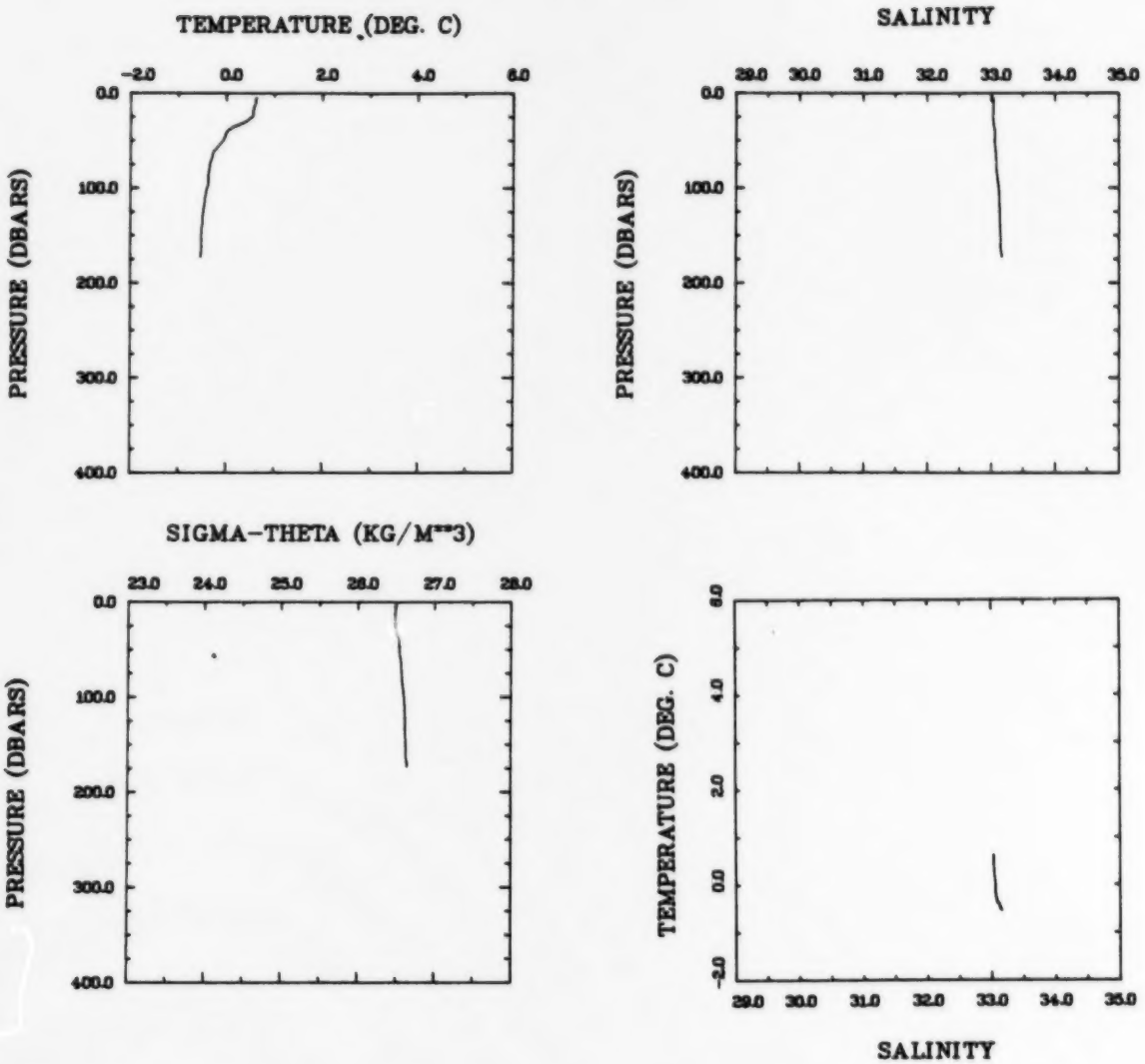


Fig. 26. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 29 in northeastern Hudson Strait.

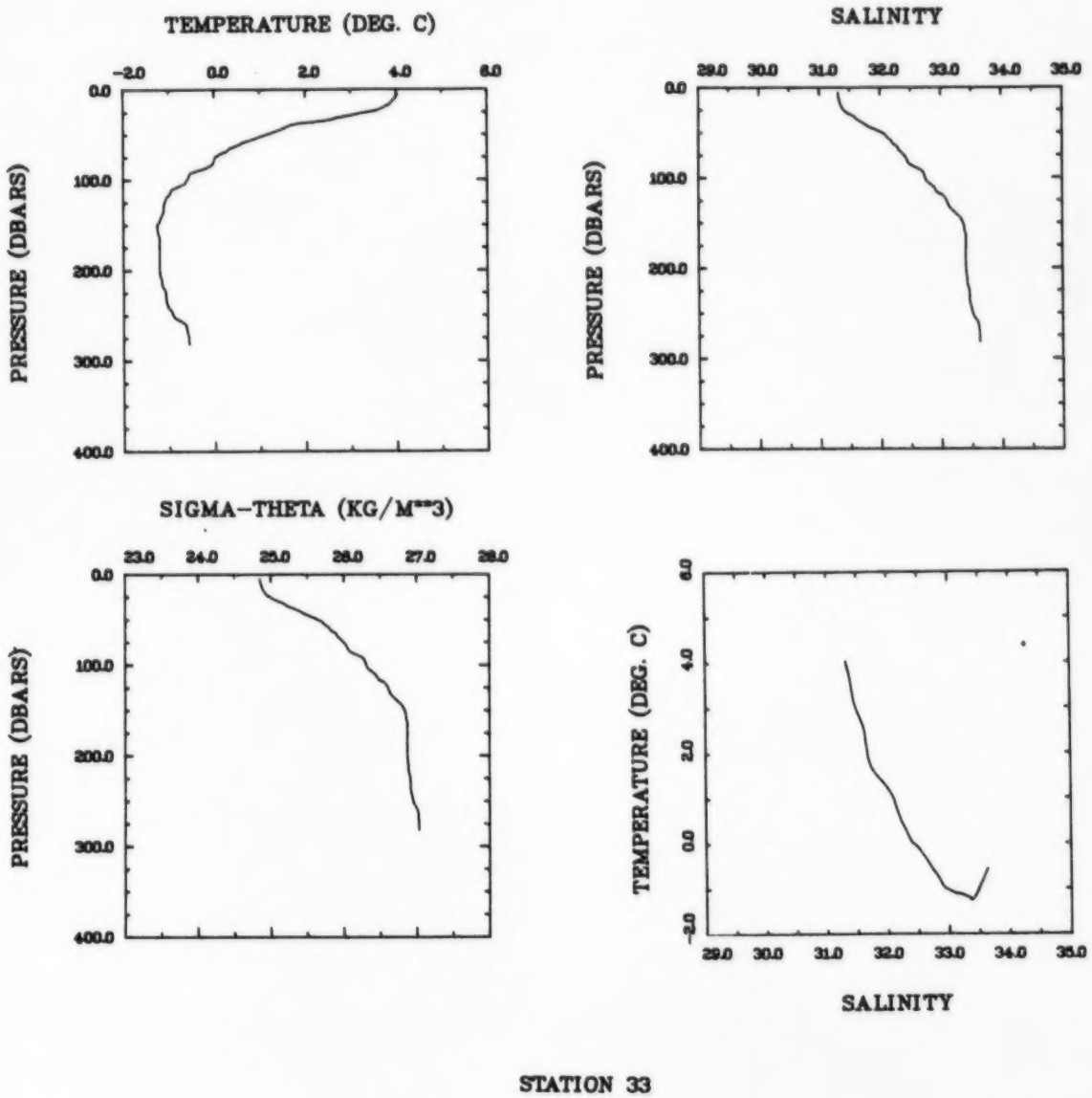


Fig. 27. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 33 off Cape Hopes Advance.

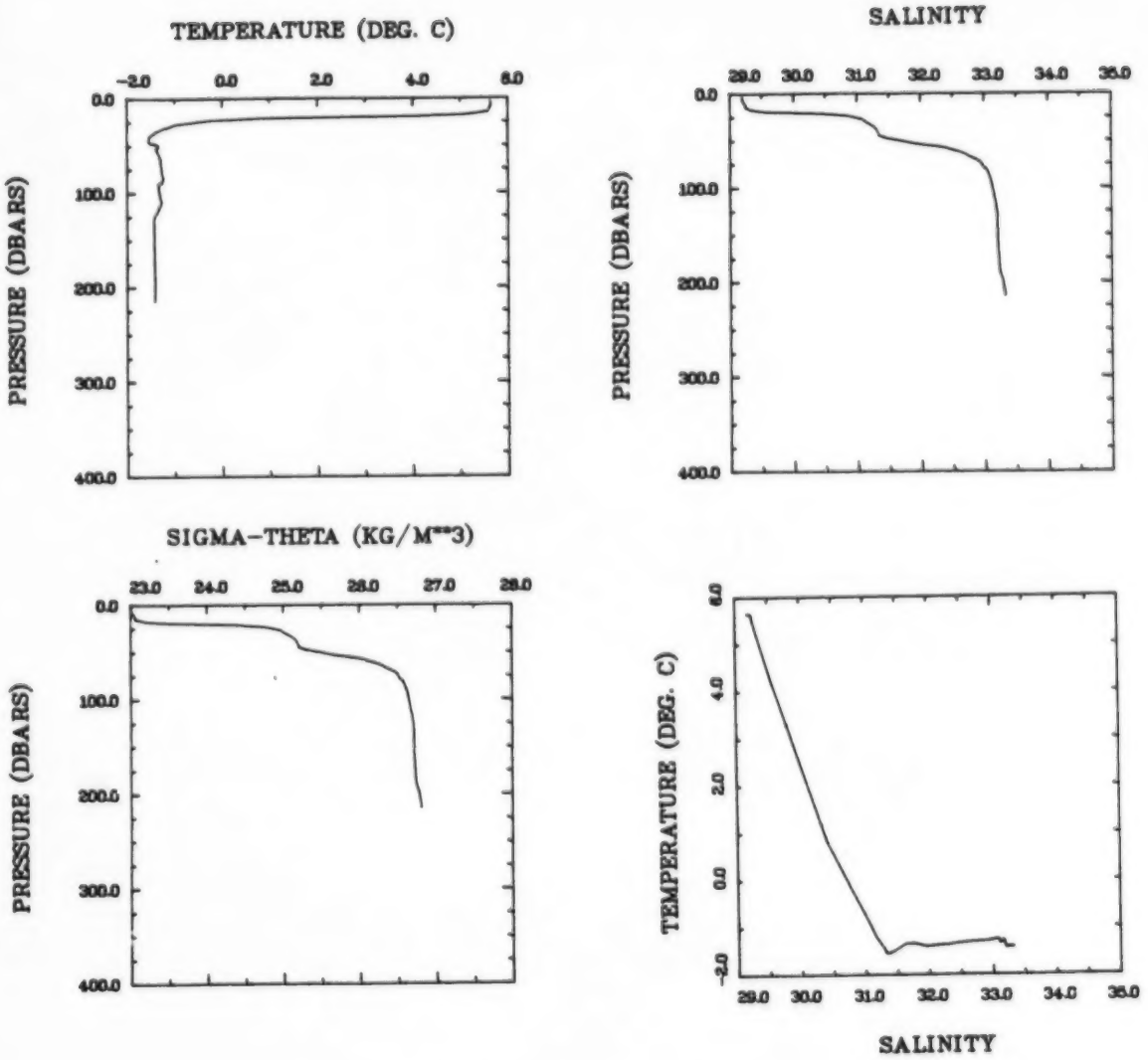


Fig. 28. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 52 in northern Hudson Bay.

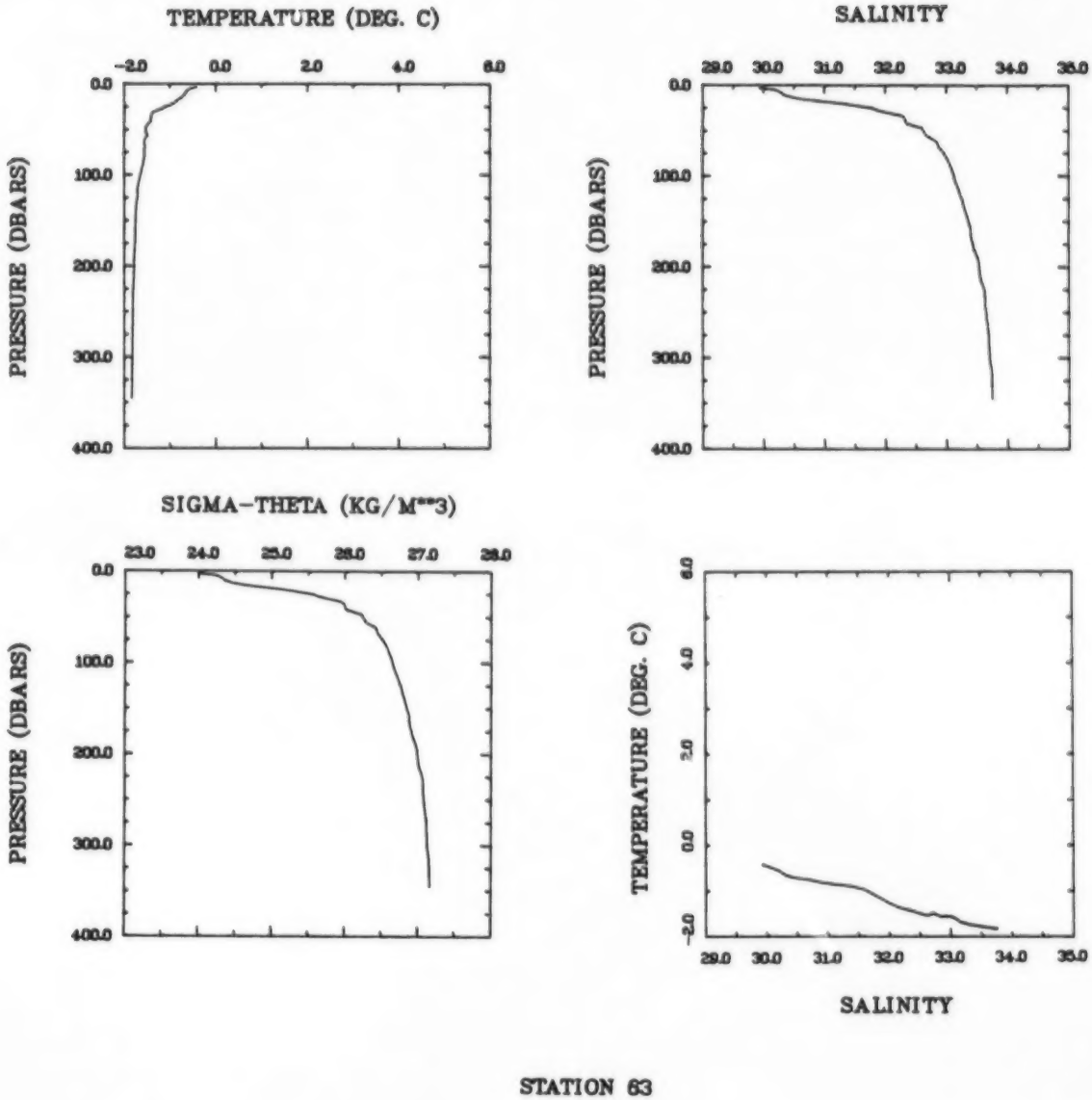


Fig. 29. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 63 in western Foxe Basin.

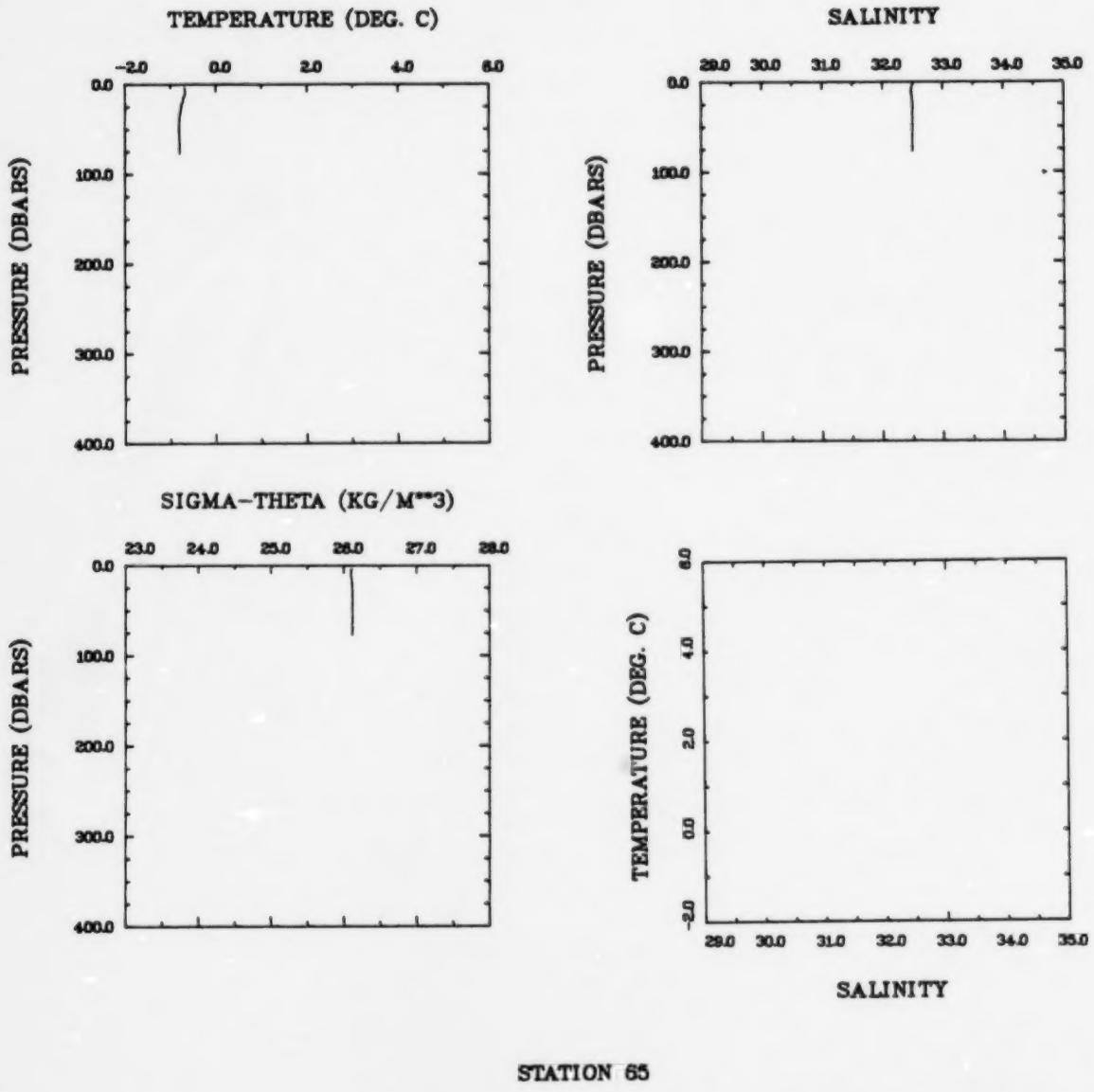


Fig. 30. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 65 in eastern Foxe Basin.

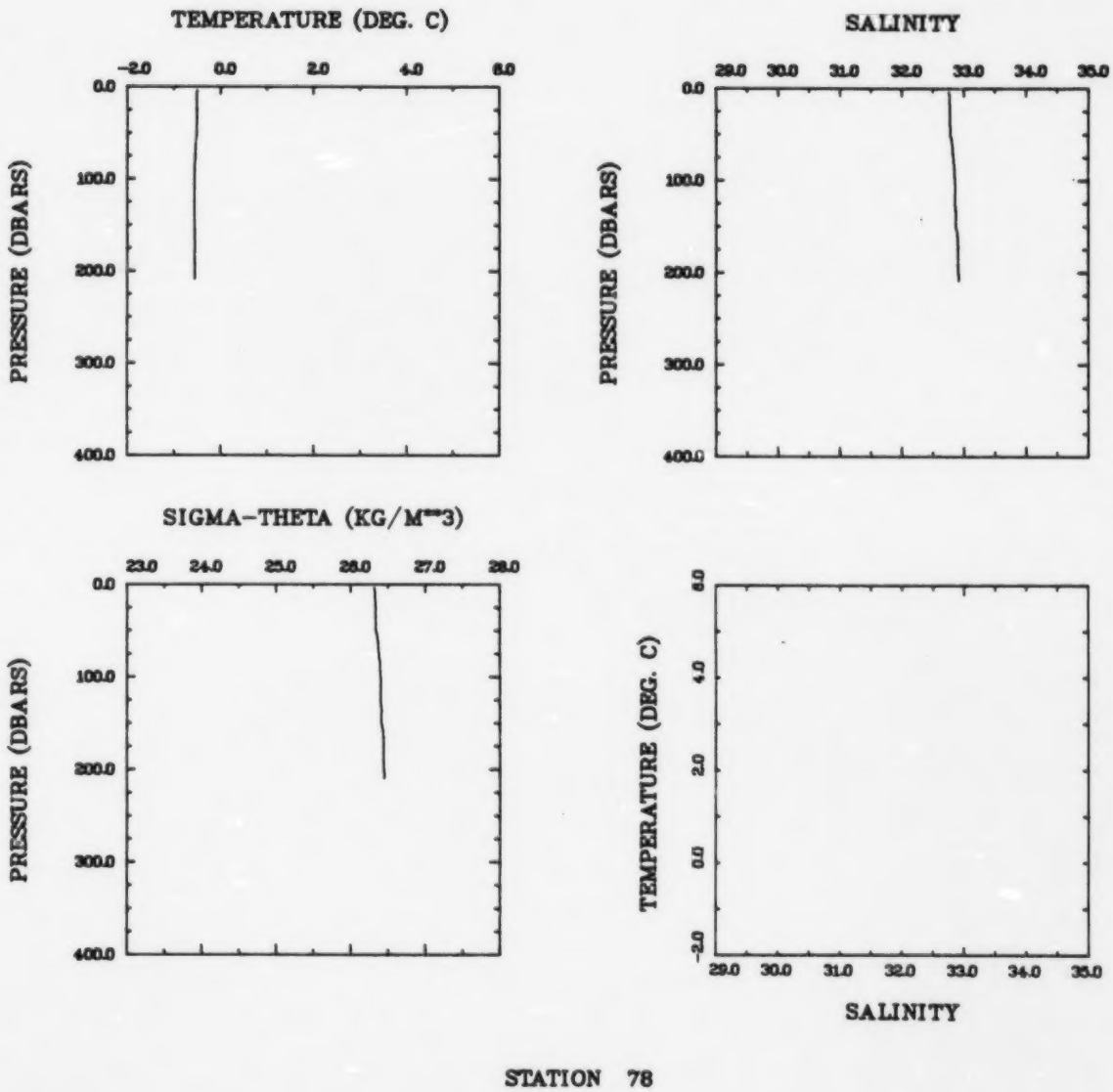


Fig. 31. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 78 in Gabriel Strait off southeastern Baffin Island.

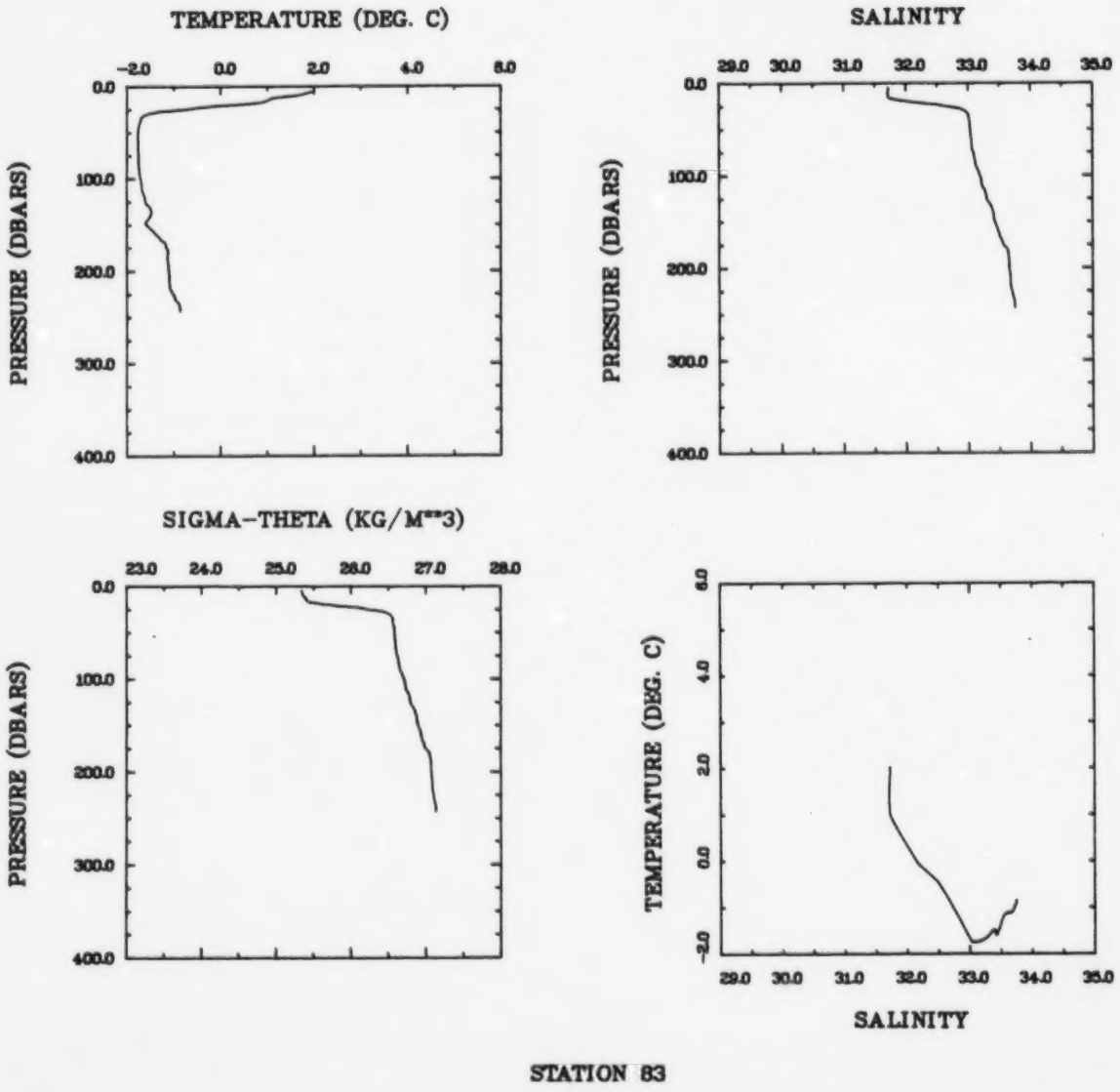


Fig. 32. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 83, inshore on the southern Baffin Island Shelf.

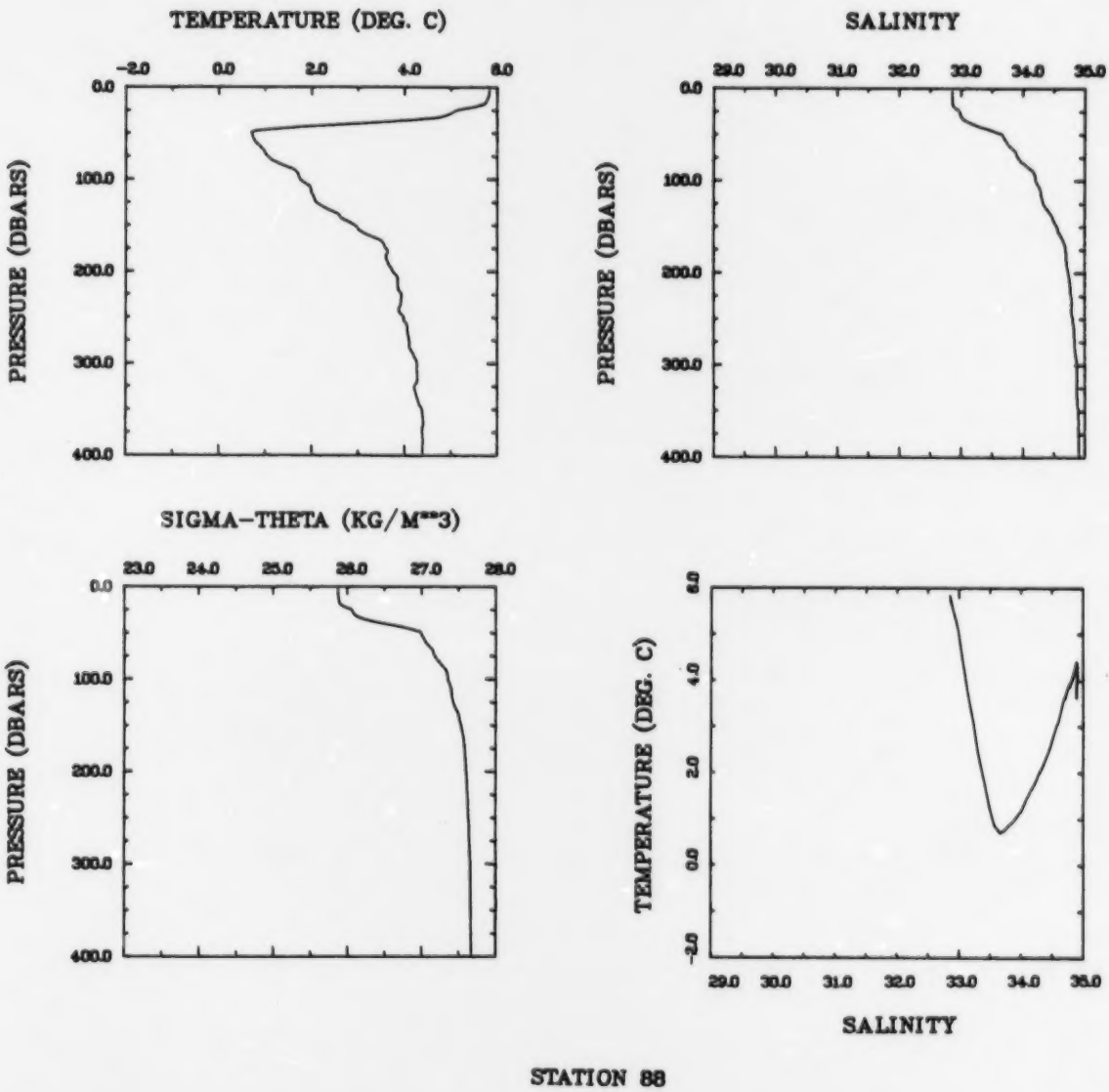


Fig. 33. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 88, offshore on the southern Baffin Island Shelf.

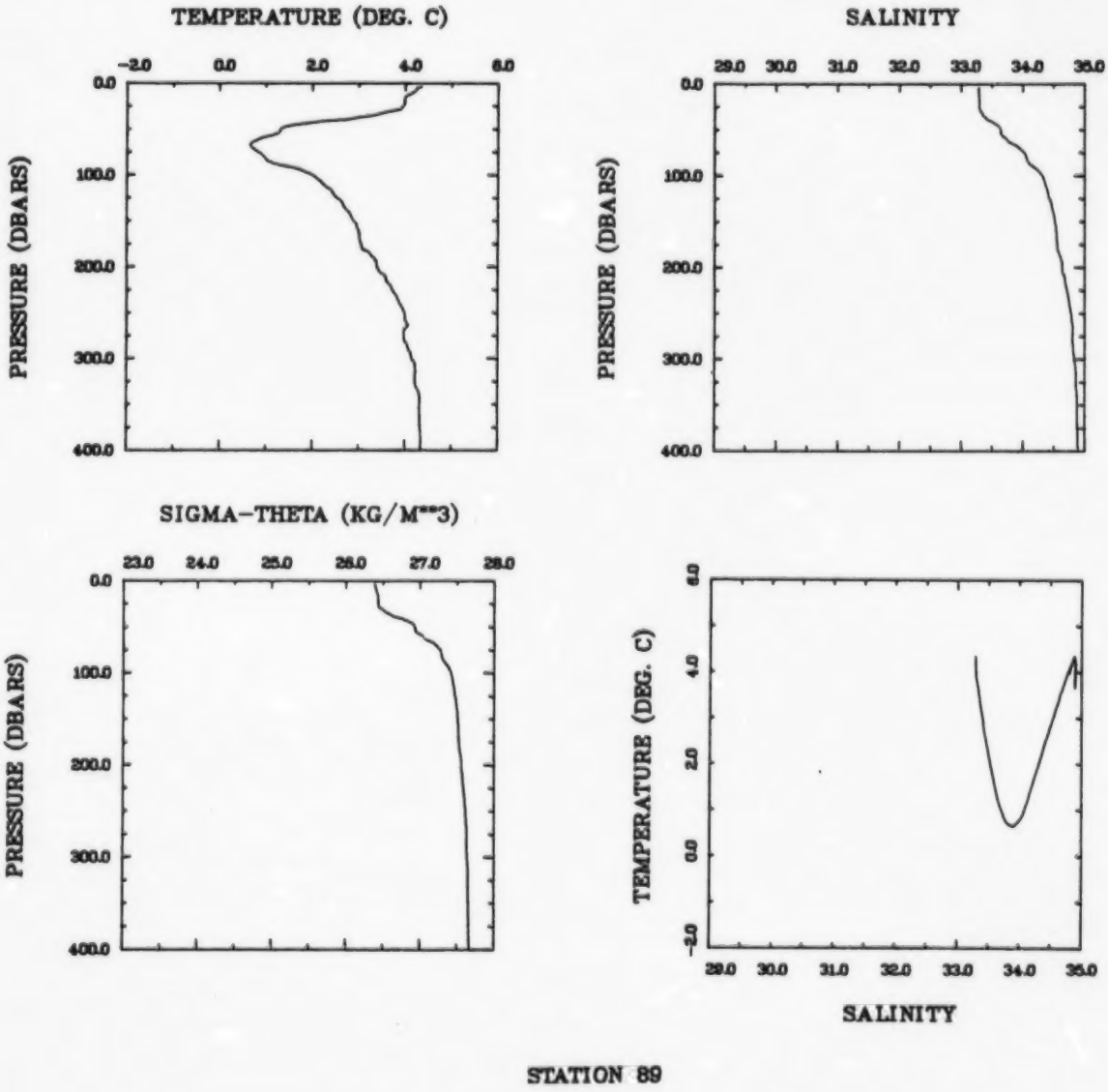


Fig. 34. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 89, offshore on the northern Labrador Shelf.

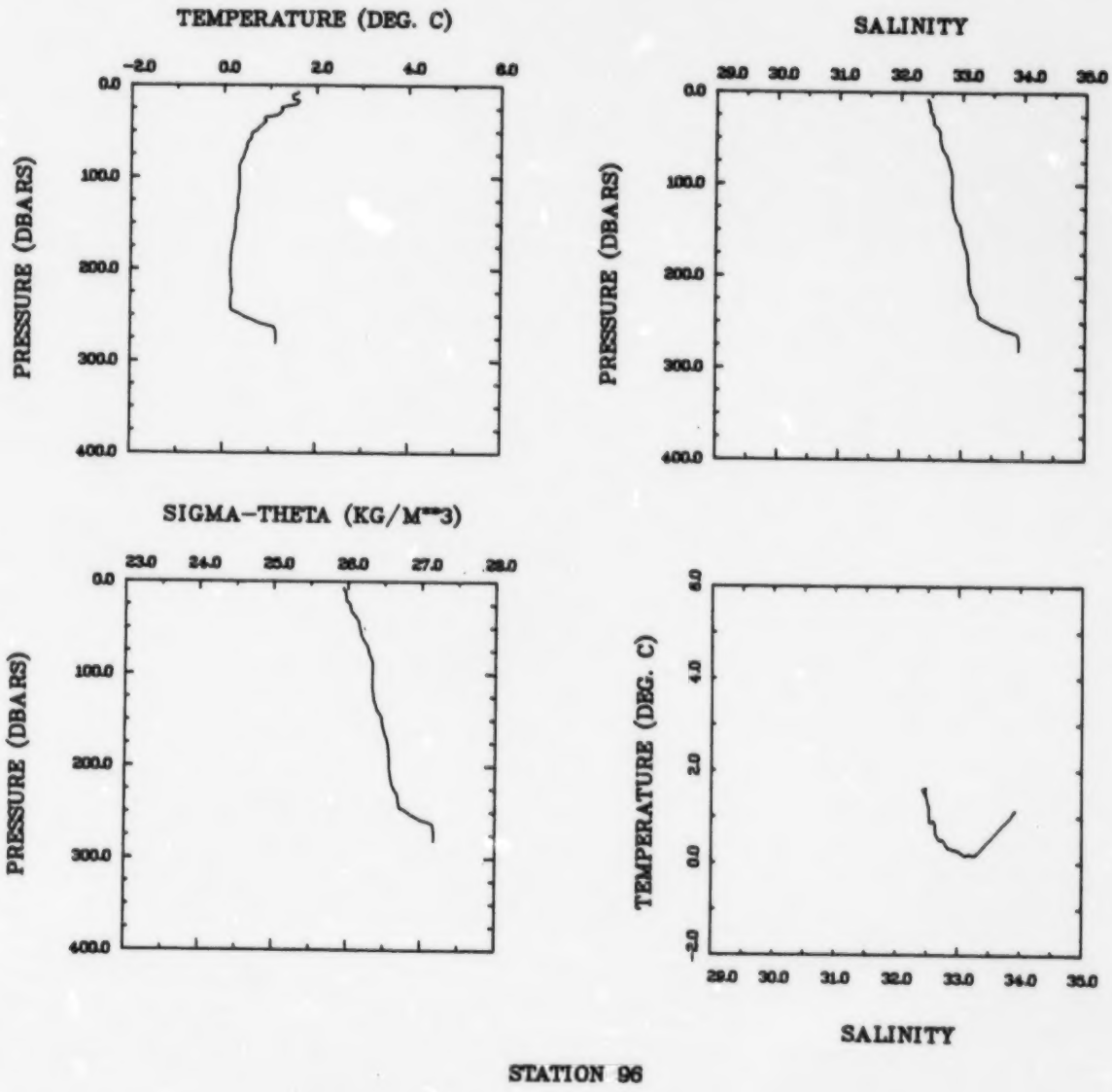


Fig. 35. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 96, inshore on the northern Labrador Shelf.

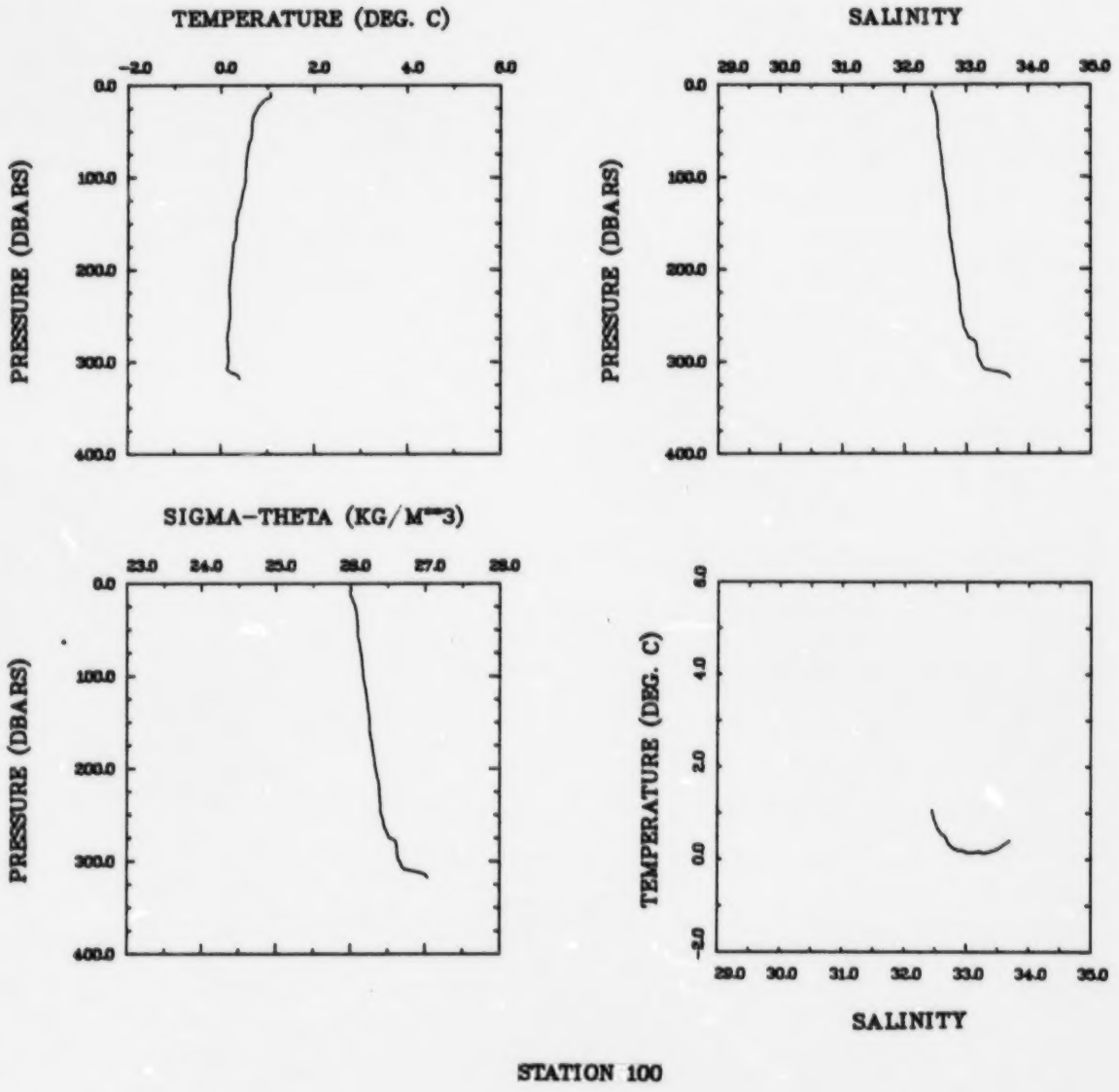


Fig. 36. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 100 on the south side of the eastern entrance of Hudson Strait.

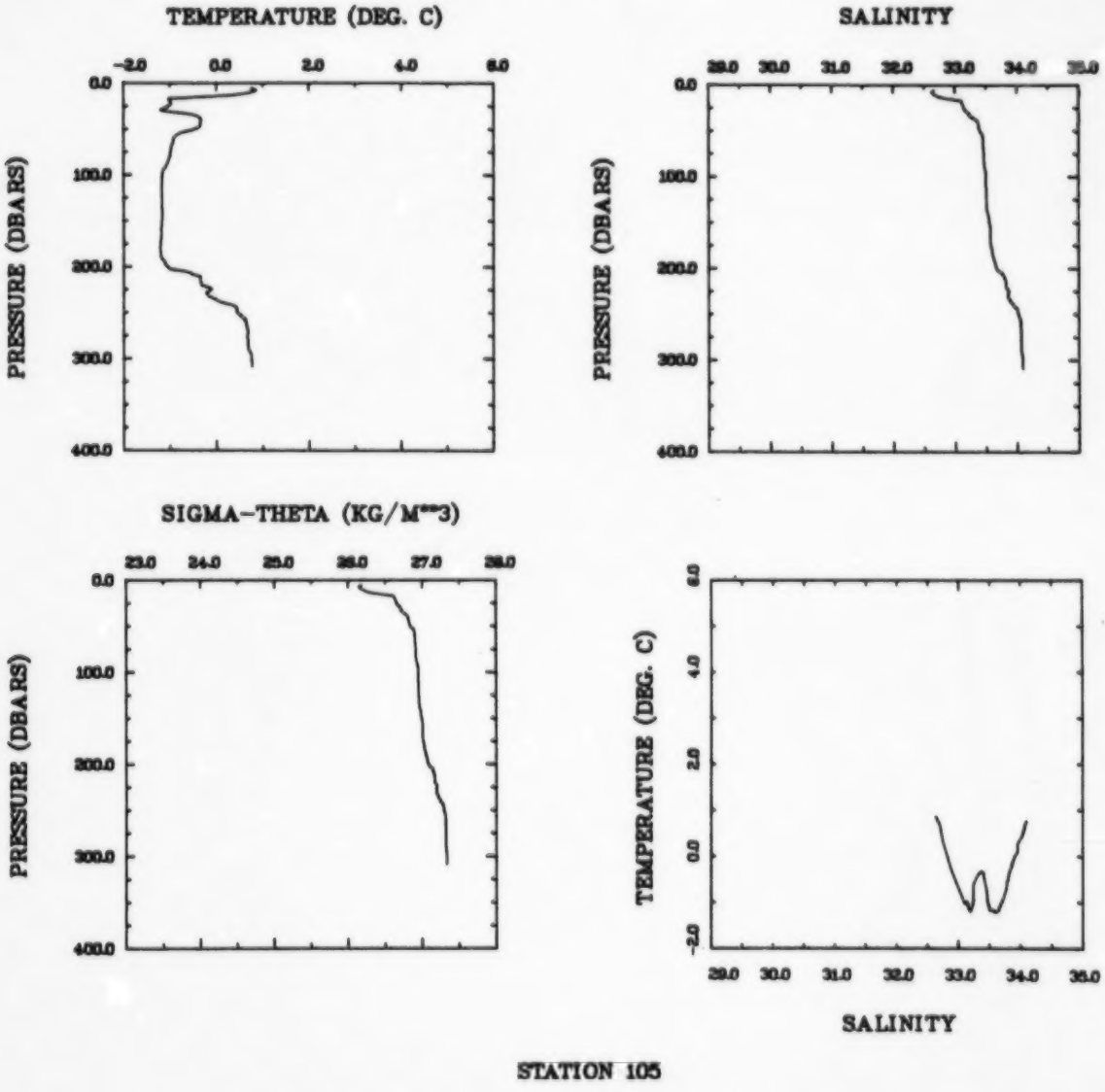


Fig. 37. Vertical profiles of temperature, salinity and sigma-θ and the T-S diagram at station 105 on the north side of the eastern entrance of Hudson Strait.